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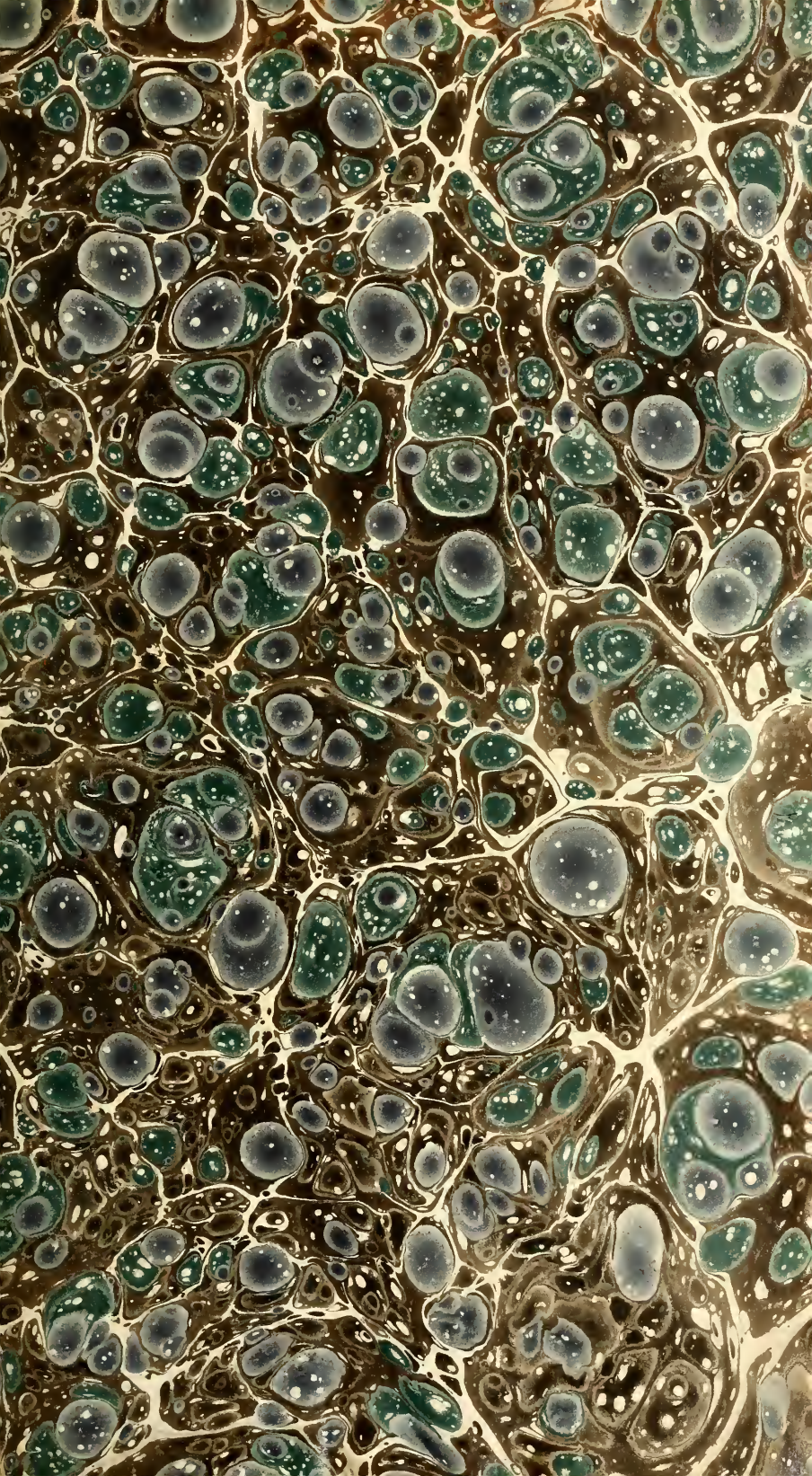


Library of the

CHESAPEAKE AND OHIO CANAL COMPANY.

MEMORIAL

OF

The Chesapeake and Ohio Canal Company.

December 5, 1828.—Referred to the Committee on Roads and Canals.

To the Senate and House of Representatives of the United States of America in Congress assembled:

The memorial of the Chesapeake and Ohio Canal Company

Respectfully represents:

That, shortly after the close of the last session of Congress, a general meeting of the Stockholders was held, at which the undersigned were duly elected President and Directors of the Company. They proceeded, under the charter which had been granted by the Congress of the United States, the States of Virginia, Maryland, and Pennsylvania, and confirmed by the assent of the Potomac Company, to execute the trust reposed in them.

In the progress of this duty, it became, in the opinion of the undersigned, expedient, for the preservation of harmony among the principal subscribers, to convene a second general meeting of the Company, in order to fix, definitively, the eastern termination of the Canal within the District of Columbia.

Accordingly, a meeting, after due notice, was held for that and other purposes, by a very large majority in interest of the Stockholders, in the City Hall of Washington, who, after much deliberation, adopted the resolutions, which, along with a copy of such part of the proceedings of the general meeting as relate thereto, are annexed to this memorial. [See Appendix A.]

The Attorney General of the United States having, on due consultation, pronounced the opinion required by the resolutions to give effect to the decision of the Company, that their charter authorized the termination of the main stem of the Canal, in the manner proposed and sanctioned by the concurrent voice of a large majority of the Stockholders, the obligation devolved upon the President and Directors to present to your honorable bodies a memorial, requesting such aid as to your wisdom may seem expedient, towards the extension of a Canal from some suitable point upon the Chesapeake and Ohio Canal, to Alexandria, in the District of Columbia; and towards the construction of another Canal from the main stem to the Navy Yard of the United States, on the Eastern Branch, at the level of the Potomac river at the head of the Little Falls. [See Appendix B.]

The duty, thus charged upon the undersigned President and Directors, cannot well be performed without adverting to the considerations which led them to recommend the annexed resolutions to the general meeting, and the Stockholders to adopt them with so much unanimity: nor can such re-

ference be useful, or even intelligible, without also adverting to the true origin of the Chesapeake and Ohio Canal.

Whatever views may have antecedently existed, at any time, with respect to the improvement of the navigation of the Potomac, or any of the branches of the Ohio which approach its head waters, by opening their sluices; by forming short canals and lift locks around their principal obstructions; or conducting continued canals along their valleys; the Chesapeake and Ohio Canal, or a connected navigation across the Alleghany Mountains, from the tide of the Potomac to the Ohio, had never entered into the conception of any one, much less had it been ever seriously contemplated, until the Board of Public Works of Virginia confided to their principal Engineer the survey of those rivers, in order to ascertain the practicability of their union.

It was discovered and made known, on the summit of the Alleghany, in the summer of 1820, to be possible to effect, by a navigable Canal across that great barrier, a junction of the eastern and western waters. This discovery was first noticed in the House of Representatives, by the Committee on the District of Columbia, in their report of the 3d of May, 1822, on numerous memorials from the States of Maryland and Pennsylvania, which had been referred to that Committee, and which were of various tenor, but united in asking nothing more than the aid of Congress to improve the defective navigation of the river Potomac.

To attract the public attention to the more enlarged purpose suggested in the report of the Committee of the House of Representatives, of uniting, by one continued canal, the waters of that river with the highest steam-boat navigation of the Ohio; and that, with the southern shore of Lake Erie; to manifest the practicability and importance of so vast an improvement of inland navigation; as well as to provide the means of effecting it; a convention of delegates from Virginia, Maryland, Pennsylvania, and the District of Columbia, assembled, by prior invitation, in the Capitol in Washington, on the 6th of November, 1823. By this assemblage, which has, ever since, borne the title of the "Chesapeake and Ohio Canal Convention," its present denomination was given to the Chesapeake and Ohio Canal; the terms of the charter to be sought, in order to authorize its construction, were considered in this Convention, discussed, and settled; the dimensions of the canal were limited; its cost was estimated; and among the means adopted for providing the charter and the necessary funds to complete it, there was created, by order of the Convention, and appointed by the Chairman, a permanent Central Committee, with authority, in the name and behalf of the Convention, to appeal, by memorial or otherwise, to Congress, the States whose sanction was necessary to the charter, and to the three cities of the District of Columbia, for subscriptions to the stock of the canal, according to certain prescribed proportions. (See App. C.)

While the General Government was expected to regard the proposed enterprise as an object of national importance, the States and the commercial towns interested in its success would, it was believed, regulate their subscriptions to its stock, by their respective ability, and the bearing of the common enterprise upon their separate and peculiar interests.

It was early perceived, that, in its prosecution, the co-operation was to be obtained and preserved, of many rival interests, as well in the States who were to become parties to the charter, as in the towns of the District of Columbia. To limit the termination of the canal, in its descent, with

a common name, and common funds, to that point, wherever it might ultimately be found, below which those interests begin to diverge from a common line, and might consequently be expected to split asunder, was deemed highly expedient. Although, therefore, the charter of the Chesapeake and Ohio Canal Company did not restrict the eastern termination of the main canal to a prescribed point on tide water in the District of Columbia, it was regarded as essential to the union of those local interests, which it was expedient to harmonize, that it should not be extended below the locks of the present canal of the Little Falls, without the assent of these interests. A very important one was known to arise from the desire of the State of Maryland, subsequently expressed on the face of her laws, to extend a branch from the main canal, through Georgetown and Washington, to Baltimore, her commercial emporium, and to Annapolis, her capital.

The subscription of half a million of dollars to the stock of the Chesapeake and Ohio Canal, which she authorized in March, 1826, was coupled with the conditions, among others, that the practicability of such extension should be demonstrated, and that ample power to make it should be given, by the United States, to any company which she might incorporate, for the purpose of conducting such canal through the territory of the District of Columbia.

By a survey conducted with a view to the first of these conditions, it was manifested that such a branch of the Chesapeake and Ohio Canal could be made, provided that the main trunk be brought down, as far as the immediate vicinity of Georgetown, on the level of the Potomac, at the head of the Little Falls. This level was required, to carry the Maryland Canal across the creek which divides Georgetown from Washington, and along the rear of the buildings in the latter, with an adequate supply of water, and without very deep cutting, as far as the Eastern Branch, on a route common to Baltimore and Annapolis.

By the several acts of Congress, confirming or amending the charter of the Chesapeake and Ohio Canal Company, the power had, already, been secured to the State of Maryland, to cut a canal from the main trunk, and to use its water for that purpose, if it could be spared without injury to the latter; and the District cities having, after much consideration and mutual consultation, approved of an extension of the stem of the canal to a basin at, or next above, the upper boundary of Georgetown, which had been recommended by the United States' Board of Internal Improvement, in their reported plan of this work, such an extension was, accordingly, incorporated, by a late act of Congress, as a condition of the subscription by the United States, of a million of dollars to the stock of the Canal. The same act of Congress further provided, under the like sanction, that, so far, at least, as the proposed basin, the canal should be of such enlarged dimensions, as to leave no doubt, whatever, of a sufficient supply of water, through the main canal, for the Maryland branch, without injury to the former.

Here, it was confidently anticipated, by many of the active friends of this great enterprise, that the main canal would have its eastern termination. They expected that, from the proposed basin, the extension of its navigation would be effected, by various branches, severally adapted to the respective interests of those who might undertake their construction.

The City of Washington, however, felt herself aggrieved by the effect

of this expectation among the neighboring towns of the District, and induced the undersigned President and Directors to seek, through the terms of the annexed resolutions, such farther extension of the common enterprise, as should ultimately heal this unhappy disagreement, threatening, as it did, for a while, the stability of the great work committed to their care.

The Canal is, now, by the definitive order of a general meeting of the stockholders, to end in a basin, at the mouth of Rock Creek, the common boundary of Georgetown and Washington, or, if it shall be hereafter the wish of the latter, at the mouth of the creek which washes the base of the hill on which the Capitol is erected.

It is deemed, after this preliminary explanation, the less necessary to enlarge upon the probable effects of this final termination of the canal, except so far as regards the immediate objects of this memorial. If traced on the map of Georgetown, it will be seen, that the late decision of the company brings the level of the Potomac, at the head of the Little Falls, which it had been proposed, for the accommodation of the State of Maryland, to conduct to a basin at, or just above, Georgetown, to a point near the centre of that town, several hundred feet lower down the river than that which is referred to in the late act of Congress; and, consequently, so much nearer to the eastern branch of the Potomac.

Descending from its high elevation, at this point, by four locks, with intermediate parts of water, to the Potomac, by the mouth of Rock Creek, the main canal terminates its high level in the heart of Georgetown, and leaves that level to be extended to the Eastern Branch, at the future cost of the State of Maryland, of the United States, or of the City of Washington.

The stem of the canal, from the basin at the mouth of Rock Creek to the foot of the Cotoctin mountain, a distance of forty-seven miles, will shortly be placed under contract for execution. An addition of five miles would extend it, on a level of thirty-seven feet, above the tide, to the Navy Yard, upon the Eastern Branch. An inquiry arises, Shall this be done, and by whom shall it be effected?

The State of Maryland incorporated the "Maryland Canal Company" in March, 1826, chiefly, if not solely, for the sake of her great commercial emporium on the Patapsco; and the citizens of Baltimore having, in the next succeeding February, obtained a charter for the construction of a rail-road from the Patapsco to the Ohio, the canal, designed for the same purpose, may be regarded, for the present, as abandoned.

It remains, therefore, for the United States, or the citizens of Washington, to determine whether a canal of about five miles, at the high level of 37 feet above the tide, shall be extended, from Georgetown to the Navy Yard, on the Eastern Branch.

The subscription of a million of dollars to the main canal, by the City of Washington, like all the other subscriptions to the stock of the Chesapeake and Ohio Canal, faithfully paid as called for, is considered, by her citizens, as discharging them from the obligation to bear a part in the cost of making this important branch from the main canal: while the deeper interest of the Government of the United States in its construction, has induced, among them, as well as the stockholders of the Chesapeake and Ohio Canal Company in general, the confident hope, that Congress will consider it as worthy of their regard. The conviction is entertained by the undersigned President and Directors, that such a branch from the

main canal, since it would afford, at the expense of constructing but five miles of canal, one continued level of ten miles through the District of Columbia, may, at a cost comparatively small, be rendered, to the public benefit, a commodious highway, for the constant intercourse of the citizens of the District, from one extreme to the other of its territory, while it shall convey to the navy yard an ample supply of water, and water power, for all naval purposes.

The accompanying plat will show the relation which this short line of canal bears to the lots still held, by the United States, within the city of Washington. The appreciation of this extensive and valuable property, already assured by the foundation laid for the completion of the Chesapeake and Ohio Canal, will be much more enhanced, it is obvious, by a branch from the main stem of that canal, passing in the proposed direction.

But, although this local benefit would more than repay the highest estimated cost of this branch, it is to the greater utility of such a work, for military and naval defence, that your memorialists presume to appeal in support of their present application.

In the instructions, from the Department of War, to the engineer charged with the survey of the route of the once contemplated canal, from the Potomac to the Patapsco, he was required to report the probable tendency of that part of this work which might be constructed in Washington, to facilitate its future defence from the sudden incursion of an invading foe. For his reply to this part of his orders, your memorialists beg leave to refer to his report, communicated to the House of Representatives by the Secretary of War.

However important such a bulwark, insulating, to a great extent, as it undoubtedly would, the public and private edifices of the City of Washington, might prove under circumstances of sudden and unforeseen danger, the undersigned are animated by views yet more enlarged, in appealing, for the support of their present application, to the provident forecast of a Legislature, charged with the protection of the entire Union, but more especially, from the peculiar position of the seat of its operations, with that of the waters and shores of the Chesapeake.

Your memorialists advance, they trust, with becoming diffidence, the apprehension, of which, the anticipation of future danger justifies the disclosure, that, in the contemplated defences of the Chesapeake, at the entrance, and in the vicinity, of Hampton Roads, so long as they are unaccompanied by an efficient provision for the prompt construction as well as equipment of ships of war, near the head of the same bay, sufficient precaution will not have been taken, for the security, in future wars, of the shores and commerce of that bay: a commerce, may not your memorialists add, of vast importance, not only to the five States bordering on this great estuary, or intersected by its tributary streams, but to the prosperity of the entire Union; to the interchange of whose commodities, as well as the constant intercourse of whose citizens, this capacious bay, and the many copious rivers which pour their waters into it, serve as an indispensable facility.

If ever the entrance of Hampton Roads shall be effectually secured from naval aggression, by the fortifications designed for its defence, and the Navy Yard at Gosport from sudden destruction, by a military expedition,

over land, from the open bay of Lynnhaven, still, the experience of the last American war demonstrates that the mouth of the Chesapeake may be effectually sealed up, by an enemy's squadron lying under the shelter of Cape Henry.

To drive such a fleet from its moorings, if superior to the naval force of the United States in Hampton Roads, would be, on ordinary calculation, impracticable, as it would alike prove, if attempted by an inferior squadron, suddenly gathered from the other posts of the Union to the north or south of the Chesapeake. Nor could an union of these forces supply the deficiency of either, in a concerted attack, since the wind which blew in one of them, from sea, would shut up the other in Hampton Roads. It would be otherwise with a squadron descending the bay. Combining, as it proceeded to the Capes, with that in Hampton Roads, it would be carried, by the same wind, against the common enemy, who, if he quitted his station, to intercept their union, would leave open the Chesapeake, and an enemy behind him, which the same breeze would bring upon his rear, reinforced possibly from the Atlantic.

If these, and many other considerations, shall prompt the Government, charged with the common defence, to construct suitable docks for the prompt construction and repair of ships of war, at some secure position on the navigable waters of the Chesapeake, higher up than Gosport, and to form, at such position, a great naval depot, none will be found more suitable, it is believed, or offering greater advantages, than the Potomac.

The prices at which the works upon the forty-seven miles, embracing much of the most difficult portion to construct, of the Chesapeake and Ohio Canal, have been contracted for, have placed its speedy accomplishment beyond the reach of any rational doubt. Its last feeder, drawn from the Potomac but ten miles above the Eastern Branch, will be of an elevation capable, if it be extended to the Navy Yard, in the mode which your memorialists recommend, and applied to the construction of suitable docks, of floating the heaviest ship of war above the height necessary for her construction or repair, without hazard or delay. When the western section of the canal shall be combined with its eastern—and the success of the one has ensured already that of the other—there will be opened, from these docks and the water power formed in their vicinity, a channel, which no enemy can close, to the mouth of the Mississippi. The contemplated canals from Pittsburg to Lake Erie, and from New Orleans along the eastern shore of the Gulf of Mexico, will extend, this inland water communication to all the extremes of the Union. A comparatively short canal, one-third of which has been recently ascertained to be of very easy construction, across the counties of Frederick, in Maryland, and Adams and York, in Pennsylvania, along the vallies of the Monocacy and the Conewago, will add to the resources of the former, the productions of the Susquehannah, and an inland water communication, by means of its rapidly extending canals, with those of New York, and with the canals now leading, from the mouth of Swatara to Philadelphia, through the valley of the Schuylkill.

To the white oak, the locust, the cedar, and the fir tree of the eastern waters, will be added, by an unimpeded and secure navigation, the live oak of Florida and Louisiana; to the iron of Pennsylvania, Maryland, and Virginia, the salt-petre and water-retted hemp of Kentucky, the lead of

Illinois, and Missouri, and the copper of the Lakes, the provisions of the Ohio, and the mineral coal of the intermediate mountains.

To collect these materials on the margin of the Eastern Branch, and to fit them for use, in the prompt construction or repair and equipment of vessels, under the eye of the Navy Department, would be the office of this branch of the Chesapeake and Ohio canal, leading to the Navy Yard of Washington, from the nearest point of the elevated canal in Georgetown. (Appen. D.)

If this branch be immediately constructed, it will encounter but few, if any obstacles, from the intervening improvements of a growing city. As these shall be multiplied by its progress, so will they be, also, adapted to its plan and direction. Unobstructed by a lock or a toll gatherer, and offering the cheapest and easiest intercourse, at all times of the day and night, to the inhabitants of two growing cities, such an improvement will serve as a lasting monument of the beneficence of the Federal Government, to a people who, having, in obedience to the wishes of their parent States, surrendered to it, their political rights of suffrage and representation, can appeal to its justice or munificence only by persuasion.

Your memorialists proceed to the second duty charged upon them. The same considerations which recommend the construction of dry docks upon the Eastern Branch, on an enlarged scale, for the speedy preparation of ships, for actual service in time of war, apply, it is believed, with equal, if not superior force, to the erection of such docks on the main river, in the harbor of Alexandria, from whence, fewer obstructions would be encountered by ships of the larger class, in descending the Potomac to the Chesapeake. To the objection, which has been applied to both stations, that the descent of these ships would be along a crooked channel, the multiplication of steamboats on the Potomac will be, it is presumed, a sufficient answer. Should it be, as your memorialists hope, the pleasure of Congress to favor, by pecuniary aid, the construction of the contemplated branch from the stem of the Chesapeake and Ohio canal, to Alexandria, the accompanying memorial from the Mayor and Common Council of that town, soliciting the incorporation of a joint stock company, with authority to construct such a branch, will afford an opportunity of extending such aid, in the same mode in which the wisdom and liberality of the Federal Legislature has already assured the success of several great National works.

The utility of the main canal, from which this branch is to lead, cannot fail to be much augmented, by supplying a third market for the numerous and diversified productions which are destined to descend the valley of the Potomac, and another inlet for their valuable returns from abroad.

The Chesapeake and Ohio Canal Company comprehends many citizens of Virginia, as well as of Maryland. They have now assigned to them, under the sanction of existing laws, the chartered rights of a prior company, which the States of Maryland and Virginia incorporated, by their joint act, in the first years of their independence, and to whose stock those States contributed, for the sake of the markets which they have since ceded to the General Government.

Your memorialists trust that in referring to the double grant, which conveyed to the Congress of the United States this important District, embracing then, as it still does, the only markets of the Potomac and its tributaries, they may be allowed to add, that the inhabitants of Virginia who disposed of their productions in Alexandria, while that town formed part of their native

Commonwealth, still feel a solicitude for its prosperity, with which, indeed, their own is in no small degree identified.

There is, however, too much reason to apprehend that, unless the citizens of Alexandria, severed as they are from their parent State, for the benefit of the Union, shall receive its countenance and favor, the Chesapeake and Ohio canal, to which they have liberally contributed their funds, in conjunction with their neighbors of Georgetown and Washington, will extend, to themselves, very few, if any, of its benefits.

The broad and unsheltered expanse of water which will meet the canal boats below Analostan Island, and the basin at the mouth of Rock creek, or of the Tiber, to say nothing of the necessary change, after leaving the canal, of the very principle of their moving power, will arrest their descent short of the harbor of Alexandria; and require a double transhipment of their cargoes, to enable them to reach a foreign or distant market, through the warehouses of that town. A trade, so impeded and burthened, could not long survive a struggle with the more favored cities on the opposite bank of the river. A continued canal from the main stem, crossing the Potomac, by an elevated aqueduct, at, or immediately above Georgetown, offers, it is believed, to the southern shore of the District of Columbia, the only chance of a fair competition with the northern.

These views have always entered into the policy of connecting the three cities of the District in the common support of the main canal, as far as the point of its present termination. Alexandria could not consent to extend that termination to the Eastern Branch, at its cost; Washington, to Alexandria; nor Georgetown to either. It has been by consulting, with due regard, these and other jarring interests, that the greater work has, so far, prospered. Alexandria is now threatened, by the rapid growth of a neighboring market, fostered by the Government, which has, in it, the seat of its operations, with a still farther reduction of that trade which she once derived from the west; a result which, in the spirit of impartial justice, the undersigned are bound, by the subjoined resolutions, to ask the aid of Congress, the exclusive Legislature of the entire District of Columbia, the sole guardian of the prosperity of its whole population, to prevent, by such proportional subscription to the stock of an Alexandria Canal Company, as may render practicable their undertaking. A plan, accompanied by an estimate of the probable cost of such a canal, has already been supplied, by an experienced civil engineer in the service of the United States. The expense of its construction, if Congress shall be pleased to afford to it the desired aid, can be defrayed, the undersigned are assured, by the resources of the corporation and citizens of Alexandria, notwithstanding their liberal contribution to the Chesapeake and Ohio canal.

C. F. MERCER, *President.*

W. SMITH,
AND'W STEWART,
PETER LENOX,
PHINEAS JANNEY,
FRED'K MAY,
JOS. KENT,

Directors of the Ches. and Ohio Canal Company.

WASHINGTON, *Dec. 6th*, 1828.

To the Senate and House of Representatives of the United States in Congress assembled:

The memorial of the Common Council of Alexandria respectfully shows: That, pursuant to an act of incorporation, the Chesapeake and Ohio Canal Company have commenced, and made great progress in, this highly important national work, intended to unite the eastern and the western waters: that its termination in the District of Columbia will be a few miles above the town of Alexandria, whereby the citizens of Virginia, Maryland, and Pennsylvania, trading to the District of Columbia, will be deprived of the advantage of easy access to one of the markets in the said District; and the citizens of Alexandria, who have subscribed liberally to the construction of the Chesapeake and Ohio Canal, will be deprived of a reasonable portion of the trade arising therefrom, unless the canal can be continued along the shore of the Potomac, in the county of Alexandria, to be connected by an aqueduct across the river Potomac, above Mason's ferry, at Georgetown, or such site as experienced engineers may direct. That the importance of the trade of Alexandria may be seen by the custom-house returns. It is favorably situated for communication with a great portion of the Northern Neck of Virginia, and has important commercial relations therewith; it possesses an excellent harbor, with depth of water, and width of channel, for ships of the largest burden; has commodious wharves and wharehouses; and will be capable of affording despatch for the shipment, in import and export, of the various merchandise and bulky commodities which will be shipped to, and brought down from, the fertile regions of the west.

Your memorialists, therefore, respectfully pray that your honorable body will grant a charter to a company, to construct a navigable canal from the Chesapeake and Ohio Canal to the town of Alexandria.

THOMSON F. MASON, *Mayor*,
R. I. TAYLOR, *P. C.*
PHINEAS JANNEY,
ANT. CHS. CAZENOVE,
HUGH SMITH.
Committee appointed by the Common Council of Alexandria.

ALEXANDRIA, *December 8d*, 1828.

APPENDIX—A.

Pursuant to public notice, a general meeting was held, on Wednesday, September 10, at the City Hall, in this City, of the Stockholders of the Chesapeake and Ohio Canal. A very large proportion of the stock was represented, and there were present at the meeting above four hundred persons.

The Mayor of the City of Washington was called to the Chair, and J. P. INGLE appointed Secretary.

The President of the Canal Company presented and read the following Report from the President and Directors of the Company:

The President and Directors of the Chesapeake and Ohio Canal Company, at the instance of the Directors residing within the City of Washington, have convened a general meeting of the Stockholders, in conform-

ity to the provisions of the charter and by-laws of the Company, in order to submit to their judgment the proper point for the eastern termination of the Canal.

It is due to themselves, as well as to the general meeting, to state, that the Board, for reasons satisfactory to a majority of their members, had, by a prior resolution, declared it to be their opinion, that it was inexpedient to settle that question at present. A part of the Board had peculiar reasons for that determination, which did not militate against an immediate submission of the subject to the stockholders; and the urgency with which a decision upon this question was understood to be pressed, by a considerable portion, in interest, of the subscribers to the stock of the Company, overcame any reluctance which the board might otherwise have felt to convene a general meeting, so soon after the organization of the Company.

In anticipation of the deliberations of the stockholders, upon the subject which is now submitted to them, efforts have been diligently and perseveringly made by the President and Directors, to harmonize the various local interests involved in the decision of it. Of these efforts the proceedings of the board afford the best evidence. It will be found, in the resolution of the Board of the 9th of August, in the report of the committee to which this resolution was referred, and in the unanimous decision of the Board upon that report.

It is for the general meeting to approve, to reject, or to modify the compromise presented by the last resolution.

The President and Directors, however, take this occasion to suggest, that, as the next contracts for the construction of the Canal will embrace the entire line from the Little Falls to the Cotoctin Mountain, and will require so much of the Canal to be completed by the end of the ensuing year, but little loss will be sustained by the company, from extending the Canal to its eastern termination, as soon as practicable, after that is fixed by the definitive judgment of the Stockholders.

The line of the Canal between the Cotoctin mountain and the mouth of the Shenandoah, being but ten miles, by being distributed into smaller sections, may be also completed in the next year, though put under contract some time after the expiration of the present. If the Canal be confined to the northern shore of the Potomac, this must, indeed, eventually depend *on the promptitude* or *delay* of the decision of the depending controversy between the Canal Company and the Baltimore and Ohio Rail Road Company.

When that shall have been decided, no obstacle will remain to the extension of the active operations of the Company, as far as Cumberland, or even to the coal banks, but the absence of the necessary funds.

Although the present general meeting has been convened for the purpose already stated, the President and Directors have presumed, without inquiring into the extent of their duty, that it would be gratifying to the stockholders to be apprised of the progress which has been made, since the annual election of the officers of the Company, towards the fulfilment of the trust confided to them.

A recollection of the protracted delay which occurred in completing the necessary subscriptions to the stock of the Company, as well as of the very numerous obstructions which retarded the maturity of its Charter, urged

upon the Board the obligation of greater diligence, in commencing the construction of the Canal.

A gentleman of great reputation, who had been pre-eminent in the valuable corps of practical Civil Engineers, formed by the New York Canals, had been earnestly, though informally invited to Washington, prior to the general meeting in June, for the organization of the Company. A resolution of the President and Directors of the Delaware and Chesapeake Canal Company, with a liberality for which this company cannot but be grateful, sanctioned the purpose of the invitation, which brought to Washington Judge WRIGHT, then, as at present, the Chief Engineer of that great work. The invitation which had been given to him, this Board unanimously approved, as soon as it was communicated to them.

As early as the 25th day of June, Judge Wright, assisted by Mr. John Martineau, a pupil of the same school of Engineers, proceeded to trace upon the ground for contract, that portion of the Canal which is designed to connect the old works of the Potomac Company at the Little Falls, with the contemplated Canal above the mouth of Seneca, where recurrence is had to the main river, for a supply of water. These gentlemen suspended their labors for the 4th of July only. At the request of the cities of the District of Columbia, the President of the United States had been invited by the Board, to give, by his presence and active agency, additional interest to the commencement of an enterprise designed to perpetuate the independence and liberty, to which that day may be regarded as having given birth. The Chief Magistrate of the American People performed this office, in the presence of many thousands of his constituents, and of the Representatives of the most distinguished Nations of the old and new world.

By the period advertised for the first contracts, Mr. Martineau, with the advice of Judge Wright, whose engagements had recalled him to the State of Delaware, prepared thirty-four sections of the Canal to be let, embracing about 17 miles and three-quarters of the most difficult part of the eastern section.

Before the proposals were issued to the contractors, the President and Directors, accompanied by Judge Wright, reviewed and approved the ground, upon which the line of the intended Canal had been so far designated and marked.

Although the notice of the first letting had been unusually short, about one hundred contractors attended at Washington, from various portions of the Union, to bid for the work. As many as four hundred and sixty-two proposals were received, and within three days after the first was presented, the thirty-four sections were let to persons believed to be competent to fulfil their engagements. As many as eighteen of these contracts, involving an expenditure of more than 160,000 of the 218,000 dollars of value contracted for, fell to the lot of contractors from New York and Pennsylvania: the far greater part of whom had been engaged, and, some of them, very extensively, in similar enterprises, in Canada, Ohio, Connecticut, New York, and Pennsylvania. But one of the thirty-four contracts was afterwards surrendered, and for its renewal, three applications were soon made; one of which was promptly accepted.

Many of the contractors coming from remote abodes, required, and were allowed time to return home, previously to their entrance upon the scene of their future labors. Other have, however, already entered upon

their contracts with vigor; and by the end of the present week, eight sections will have been actually commenced. A few of these sections will probably be completed before the Winter sets in; and no reason, as yet, presents itself, to warrant a doubt, but that the whole will be finished by the time specified in the several contracts, on the 31st of December, 1829. In the spirit of the financial regulations of the first general meeting of the Company, every guard, which caution could suggest, has been provided, in the terms of the written contracts, against future abuse. No personal or other security, indeed, has been required of the several contractors, lest it might discourage or prevent applications from a distance: but in the monthly payments for the work actually done, one fifth of its value, as assessed by the Engineer of the Company, will be retained, if deemed expedient by the Board, in order to secure a faithful performance of each contract, so long as it shall remain incomplete. Due attention will be given, in the progress of the work, to prevent the completion of any part of the line, under contract, from being so much retarded, by neglect, as to delay the cotemporaneous use of the whole, by the public, at the expiration of the ensuing year.

As preliminary to any contract, the attention of the Board was called to a deliberate consideration of the best plan to be devised, for the great work committed to their charge. In the plan for its structure, which they finally adopted, if they have erred, their error is upon the side of public utility. For reasons which they deem it unnecessary here to detail, as they would be but a repetition of reports of Committees of the Cheapeake and Ohio Canal Convention; of the House of Representatives, and of the Engineers, both military and civil, in the service of the United States; they have given to the structure of a great public work, a character, as national and as perfect as they could render it in reference to the resources actually provided, or to be rationally anticipated for its execution.

The breadth of the Canal, where practicable, without a very enlarged expenditure, they have fixed at sixty feet, for the surface of the water; its depth, for the present, at never less than five, but, ultimately, at six feet. Its narrowest breadth at the surface (and this will but seldom occur) will be fifty feet. Its breadth, at bottom, (generally, forty-five feet) will depend upon the quality of the earth through which the Canal passes, and the facilities afforded for the inner pavement of its slopes, as it progresses. All abrupt curvatures in its direction, calculated to change suddenly the line of motion, will be avoided, where practicable: and, so far, not one occurs. The inner lining of the Canal banks with stone, to save future repairs, will be resorted to, wherever the excavation furnishes abundant materials for the purpose, and they can be employed on economical terms.

Its locks will be, throughout, of stone, with chambers 100 feet by 15 feet, in the clear. The lock-gates will be of locust frames; six paddle gates opening from the lateral culverts, and four in the upper lock-gates, extending to the bottom of the chamber, will facilitate their filling, while every possible facility will be provided to empty them in the shortest possible time. For this reason, it is in contemplation, by double proposals for the construction, to consider and decide upon the comparative expediency of doubling them, as far, at least, up the line as to the mouth of the Shenandoah, or throughout the first sixty miles of the Canal.

The last feeder, in descending, will be taken from the river, just above the Little Falls, and is ordered to be constructed of the width of eighty-

and depth of six feet, with a view not only to obviate all future doubt of a sufficiency of water for the several Canals in contemplation, to the Navy Yard, to Alexandria, to Annapolis, and Baltimore, but to the application, if it shall hereafter be deemed expedient, of a large volume of surplus water to manufacturing purposes, within the District of Columbia. The current which this use of a part of the water will quicken for a few miles, not exceeding, in all, five or six from its termination, will hasten the descending trade, and retard the ascending only in the beginning of its voyage.

After this description of the plan of the Canal, it is proper, as it must be gratifying to the stockholders to reflect, that its enlargements to the proposed extent, for the first sixty miles, will probably not involve an expenditure of money, much, if at all, exceeding the estimates of Messrs. Geddes and Roberts, which was, in truth, much less than a moiety of that of the United States' Engineers.

The estimate of the former, for a canal from the upper boundary of Georgetown to Harper's Ferry, was $ 1,129,768, exclusive of the usual allowance of ten per cent. for contingencies. Of this distance, in all about sixty miles, they supposed but 45¼ miles to be sixty feet at the surface, the remaining 14¼ miles being reduced, in their plan, to forty feet. In the 17¾ miles already let, the lowest reduction of breadth is, to 50 feet at the surface; and that for but three of the seven miles and a half which Messrs. Geddes and Roberts had reduced to 40 feet.

In these 17¾ miles, however, the grubbing and clearing, excavation and embankment, puddling and external walling, being about one moiety in value of the computed labor of so much of the perfect canal, has been put under actual contract, for $ 121,000 less than the estimate of Messrs. Geddes and Roberts. An allowance of 75 per cent. advance, for double locks, upon their estimate of the value of single locks, will augment the cost of the locks of the first sixty miles of the canal, by 145,800 dollars; and if 50,000 dollars be added to this sum, for the inner pavement of the sides of the canal, throughout the same distance, supposing no reduction by future contracts, of the estimate of the cost of the other portions of the sixty miles, and of other items on the line now under contract, the advance for the double locks and inner slope, stone lining of the entire sixty miles, will be but 84,000 dollars, or at the rate of fourteen hundred dollars the mile.

A reference to the standard of prices, furnished by the recent contracts, and by the estimates of Messrs. Geddes and Roberts, affords, however, a well-grounded hope, that a considerable reduction of the actual cost, below the estimate, will be effected on the residue of the line below the Blue Ridge.

A part of the saving of expense effected by the late contracts is, indeed, due to a total change of what is technically termed, in the sense of a word of American origin, the *location* of the Canal. In the route proposed by the United States' Engineers, and followed by the Civil Engineers who succeeded them, from the Great Falls towards the District, for several miles, the canal line passed near the margin of the river, and in contact with its rocky cliffs. In that recently adopted by Messrs. Wright and Martineau, and which is shorter, by near half a mile, than the former, the line of the Canal leaves the margin of the river, at very high elevation, next below the Great Falls, and thence gradually descends, through a few

miles of favorable ground, to the river shore again. But that this, though in part, is not the sole cause of the reduction of price, is manifest, from a comparision of the avarage prices and amounts in value, of the several species of the work involved in the contracts already made, with the corresponding estimates of Messrs. Geddes and Roberts for the same work.

In relation to the improved location of so much of the Canal, and the reduction of its cost, it is but just to remark, that the late survey could not but have profited by the prior suggestions of those surveys which preceded it; and that Messrs. Geddes and Roberts entered as umpires between the Chesapeake and Ohio Canal Convention and the United States' Board of Internal Improvement, upon the review of estimates on the one hand somewhat less, indeed: but, on the other, very greatly exceeding their own. And in relation to the last two estimates, if the contract price falls short of the lowest of them, it is to be remarked, that the contracts follow a very abundant harvest of almost every species of food for men and animals. This advantage will be common to all the contracts to be executed in the ensuing year, and constitutes of itself a strong argument in favor, not only of the most rapid prosecution of the whole work, but of its immediate execution on the most approved plan.

Much is expected of that line of uninterrupted communication by water, which is universally acknowledged, as it is demonstrated to be, the shortest that can be devised, between the tide of the Atlantic, the valley of the Ohio, and the shores of the great northern lakes; an internal communication which is destined to be the great connecting link of those inland seas with the Gulf of Mexico and the Atlantic Ocean. It is with a just view to the great importance of this work, and the perfection as well as economy of its structure, that the Board have planned their scheme for its final location, and its faithful construction. They have sought for the ablest Engineers, and called to their aid assistants from various portions of the Union, in order to avail themselves of the most approved skill, and of the diversified fruits of the most enlarged experience. Of three of those Engineers they have constituted a Board, the members of which will have severally allotted to their special superintendence one third of the eastern section of the Canal, as it shall progress; but they will proceed together in tracing the line which it shall occupy, and they will be associated in one body for mutual consultation and advice, whenever cases of novelty or difficulty occur in its subsequent execution.

Liberal salaries, though not higher than past usage sanctions, have been offered to those gentlemen, in order to invite their co-operation. Experience in this, as in similar cases, has already demonstrated, that true economy will be promoted by paying for talents and skill the price necessary to secure their services. Public spirit may indeed enlist, as it quickens in all, the zeal of pre-eminent ability, without the incentive of an adequate pecuniary reward. But this principle of action cannot be exclusively or mainly relied upon as a certain basis of an enterprise requiring not only skill to plan its structure, but persevering labor to build it up.

The expenditures, already incurred in the conduct of the Canal, have been arranged under distinct heads, to which it is designed, hereafter, carefully to adhere, so that, at its termination, an exhibit may be made, not only gratifying, it is hoped, to the company, but of some practical utility to other enterprises of a similar nature. It will present, along with the aggregate of the whole expense, the respective cost of the separate items into which

the power of correct analysis has already separated the total expense of any Canal. The sums unavoidably placed to the account of contingencies, and which are settled monthly, will be found to have been inconsiderable in amount, and to class them as they are expended, as well as to reduce their number, where practicable, will be to the Board an object of continued solicitude.

The period of the next letting has been fixed for the 20th of October; and for its place, the town of Leesburg, in Virginia—a point equidistant from the extremes, and within a few miles of the line of the Canal to be let.

Should this be the last letting of the current year, in consequence of a delay of the final adjustment of the depending controversy, respecting the right of the Chesapeake and Ohio Canal Company to a choice of either shore of the Potomac for the site of their Canal, every effort will be made to extend the contracts along the line, early in the ensuing Spring; the presumption being confidently indulged, that the next Winter, at least, will terminate a controversy so unexpected by the early friends of the Chesapeake and Ohio Canal, and which, if longer continued, must involve the Company, by delay, in a heavy loss of income, upon its expended stock.

The answers to the Bills of Injunction of the Baltimore and Ohio Rail Road Company have been retarded, first to await the surrender of the rights of the Potomac Company, which took place on the fifteenth day of August last, and since that, to obtain from the records of that Company a complete compilation of the laws and documents proper to sustain the rights of this Company, whether derived directly from the several States, the United States, and the associations of individuals interested in securing the last charter, or from the surrender of the prior charter of the Potomac Company.

This compilation is now about to be completed, and no farther time will be lost in bringing the legal controversy which has arrested the progress of the Chesapeake and Ohio Canal to a prompt, and, it is hoped, a definitive issue.

By order of the President and Directors.

C. F. MERCER.

President Ches. and Ohio Canal Company.

The report was ordered to lie on the table.

The following resolutions were then submitted by the President of the Company, in behalf of the President and Directors.

"*Resolved by the Stockholders of the Chesapeake and Ohio Canal Company, in general meeting*, That, in the event that the Attorney General of the United States shall be of opinion that the Charter of the Company confers authority therefor, and the Corporations of Washington, Georgetown, and Alexandria shall respectively assent thereto, the Canal shall be extended to the mouth of Rock Creek, on the plan submitted to the President and Directors of the Company by the Engineers, Benjamin Wright and John Martineau; and that, so soon as the Corporation of Washington shall have provided, at the mouth of Tiber Creek, a basin of sufficient elevation above the tide to receive a canal leading thereto from the mouth of Rock Creek, at the height of three feet above the ordinary high tide of Potomac river, the Chesapeake and Ohio Canal shall termi-

nate therein, in the mode provided by the plan submitted to the President and Directors of the Company by the said Engineers: *Provided, however,* That, if the Corporation of Washington will prefer the construction of the Canal from the mouth of Rock Creek to the Tiber, it shall have liberty to do so at any time before the said Canal shall have been begun by the Chesapeake and Ohio Canal Company.

"*And be it further resolved,* That the President and Directors be, and they are hereby, empowered and requested, in the name and behalf of the Chesapeake and Ohio Canal Company, to present to the Congress of the United States a memorial requesting Congress will grant such aid as may seem to their wisdom expedient, towards the extension of a Canal from some suitable point on the Chesapeake and Ohio Canal, to Alexandria, within the District of Columbia; and, also, to construct another Canal to the Navy Yard of the United States, within the City of Washington, at the level of the section of the Chesapeake and Ohio Canal, at the Little Falls; and that the President and Directors of this Company be requested to instruct the Engineers of the Company to cause a suitable plan to be devised for a connexion, by means of an aqueduct across the Potomac, of the Canal of this Company, with the proposed Canal to Alexandria, and that the President and Directors, pursuant thereto, construct the northern abutment thereof, on such part of the line of the Chesapeake and Ohio Canal, as, in the opinion of those Engineers, may be best calculated for such connexion.

"*And be it further resolved,* That, if any doubt shall exist, that the provisions of a certain act of the Legislature of Maryland, passed at November session, 1794, entitled "An act in the favor of the President and "Directors of the Potomac Company, and the Commissioners of the Fed-"eral Buildings;" and a supplement thereto, passed at November Session, 1804; and, also, a certain act passed by the General Assembly of Virginia, on the 27th January, 1803, entitled "An act concerning the Potomac Company," extend to the Chesapeake and Ohio Canal Company; the President and Directors be requested to cause the same to be removed, by a memorial to the Legislatures of those States.

"*And be it further resolved,* That the President and Directors be requested to invite a subscription to the Stock of the Company by the General Assembly of Virginia."

These propositions having been read,

Gen. W. Jones moved that they be laid on the table and printed, as involving questions too momentous to be decided on the first impression, and without full examination.

Gen. Mason moved to refer them to a Committee, to consider and report upon.

After some conversation, the motion of Gen. Mason was agreed to, and they were ordered to be referred to a Committee of nine Stockholders, and to be printed, with such of the proceedings of the several Corporations on this subject as the Committee should direct.

The following gentlemen were appointed to compose the Committee, viz:

John Mason,	Samuel H. Smith,	Hugh Smith,
Walter Jones,	Francis S. Key,	John Rodgers,
John Cox,	Joseph Pearson,	Edmund I. Lee.

The meeting then adjourned, to meet again on Wednesday, the 17th inst. at 10 o'clock, A. M.

At a meeting of the Stockholders of the Chesapeake and Ohio Canal, held at the City Hall, Washington, on the 17th September, 1828, by adjournment from the 10th of the same month—

The Mayor of Washington in the Chair, and J. P. Ingle, Esq. Secretary.

The Chairman having announced that a majority of the Stock was represented in the meeting—

The Secretary of the Treasury, Mr. Rush, representing the Stock held by the United States, expressed a desire that all questions should be decided according to the terms of the Charter; that is, by voting upon the Stock.

The Chair announced that a different course had been pursued at former meetings, upon incidental questions, only by unanimous consent; and, that course being now objected to, that all questions to-day must be decided by voting upon the stock, unless otherwise allowed by unanimous consent.

On motion of W. Jones, Esq. it was

Resolved, That a Committee of two Stockholders be appointed to assist the Clerk in receiving the votes on such questions as may arise before the meeting, and to judge of the validity of such proxies as may be offered.

John Marbury, Esq. of Georgetown, and Joseph H. Bradley, Esq. of Washington, were appointed a Committee accordingly.

General John Mason, from the Committee of nine Stockholders, appointed at the last meeting to consider the resolutions then submitted, made the following report:

Resolved, unanimously, as the sense of this Committee, That, under existing circumstances, it is expedient that those measures ought, in regard to the eastern termination of the Canal, to be adopted, which shall most successfully unite the varying opinions, and promote the interests, of the several corporate sections of the District.

Resolved, as the unanimous sense of this Committee, That the Chesapeake and Ohio Canal shall terminate, in descending the Potomac river, and be locked down to the tide water, on the northern side, at the highest point practicable and convenient, above the brick house occupied by Zachariah Baker, and not higher up than the rocks in the river rising above the level of the water, about half a mile below the locks constructed by the Potomac Company: *Provided*, and it is understood, that this resolution is not to be taken or understood as an abandonment of any power, originally inherent in the Chesapeake and Ohio Canal Company, to extend and prolong the Canal in such way as the Stockholders shall, in general meeting, at any future period, prescribe, and as may be within the corporate powers of the Company.

Therefore, in lieu of the first resolution referred to the Committee by the Stockholders, at their meeting of the 10th inst. the following resolution is respectfully recommended to their adoption:

Resolved, By the Stockholders of the Chesapeake and Ohio Canal Company, in general meeting, That the Chesapeake and Ohio Canal shall, in descending the Potomac river, terminate, and be locked down to tide water, on the northern side, at the highest point practicable and convenient, above the brick house occupied by Zachariah Baker, and not higher up than the rocks in the river rising above the level of the water, about half a mile below the locks constructed by the Potomac Company: *Provided*, and it is understood that this resolution is not to be taken or understood

as an abandonment of any power, originally inherent in the Chesapeake and Ohio Canal Company, to extend and prolong the Canal in such way as the Stockholders shall, in general meeting, at any future period, prescribe, and as may be within the corporate powers of the Company.

It is further recommended, that the second resolution be amended, by inserting, in the 6th line of the printed copy, the word "the" in lieu of the word "a;" and in the 8th line, after the word "to," the words "the extension of the" in lieu of the words "to construct another."

Resolved, That the third and fourth resolutions be reported without amendment.

The votes of the Stockholders were taken on agreeing to so much of the above report as proposes a substitute for the first resolution, and decided in the negative—Yeas 662, Nays 5,137.

So the meeting refused to concur in the first and principal amendment reported by the Committee of Stockholders.

The first resolution moved at the last meeting of the Stockholders being then under consideration, as follows:

Resolved by the Stockholders of the Chesapeake and Ohio Canal Company, in General Meeting, That, in the event that the Attorney General of the United States shall be of opinion that the Charter of the Company confers authority therefor, *and the Corporations of Washington, Georgetown, and Alexandria shall respectively assent thereto*, the Canal shall be extended to the mouth of Rock Creek, on the plan submitted to the President and Directors of the Company by the Engineers, Benjamin Wright and John Martineau; and that, so soon as the Corporation of Washington shall have provided, at the mouth of Tiber Creek, a basin of sufficient elevation above the tide to receive a canal leading thereto from the mouth of Rock Creek, at the height of three feet above the ordinary high tide of Potomac River, the Chesapeake and Ohio Canal shall terminate therein, in the mode provided by the plan submitted to the President and Directors of the Company by the said Engineers: *Provided, however*, That, if the Corporation of Washington shall prefer the construction of the Canal from the mouth of Rock Creek to the Tiber, it shall have liberty to do so at any time before the said Canal shall have been begun by the Chesapeake and Ohio Canal Company.

The Mayor of Alexandria (Th. F. Mason, Esq.) moved to amend the same, by striking out the words following, viz:

"And the Corporations of Washington, Georgetown, and Alexandria, shall respectively assent thereto."

And the question was determined in the affirmative—Yeas 4,051, Nays 528.

The question was then taken on the said first resolution, as amended, and decided in the affirmative—Yeas 4,561. Nays 538.

The second and third resolutions proposed by the President of the Company, at the last meeting, being then under consideration, in the words following, viz:

And be it further resolved, That the President and Directors be, and they are hereby, empowered and requested, in the name and behalf of the Chesapeake and Ohio Canal Company, to present to the Congress of the United States a memorial requesting Congress to grant such aid as may seem to their wisdom expedient, towards the extension of a canal from some suitable point on the Chesapeake and Ohio Canal, to Alexandria,

within the District of Columbia; and, also, to construct another canal to the Navy Yard of the United States, within the City of Washington, at the level of the section of the Chesapeake and Ohio Canal at the Little Falls; that the President and Directors of the company be requested to instruct the Engineers of this company to cause a suitable plan to be devised for a connexion, by means of an aqueduct across the Potomac, of the canal of this company with the proposed canal to Alexandria, and that the President and Directors, pursuant thereto, construct the northern abutment of the aqueduct, on such part of the line of the Chesapeake and Ohio Canal as, in the opinion of the Engineers, may be best calculated for such connexion.

And be it further resolved, That, if any doubt shall exist, that the provisions of a certain act of the Legislature of Maryland, passed at November session, 1794, entitled "An act in favor of the President and Directors of the Potomac Company, and the Commissioners of the Federal Buildings;" and a supplement thereto, passed at November Session, 1804; and, also, a certain act passed by the General Assembly of Virginia, on the 27th January, 1803, entitled "An act concerning the Potomac Company," extend to the Chesapeake and Ohio Canal Company, the President and Directors be requested to cause the same to be removed, by a memorial to the Legislatures of those States.

The question was taken upon the amendment reported thereto by the general committee of the stockholders, and decided in the negative, by a nearly unanimous vote.

The question was then taken on agreeing to said second and third resolutions, and decided in the affirmative—Yeas 5047.

Thomson F. Mason, Esq. offered the following resolution:

Resolved, That no decision of the stockholders, taken at this meeting, is to be construed as in any manner restricting the Board of Directors from using their discretion in locking down from the canal to the tide at any point at or above the contemplated basin at Georgetown.

And the same was unanimously agreed to.

F. S. Key, Esq. offered the following resolution:

And be it further resolved, That (if either of the Corporations shall at any time require it) locks shall be constructed, descending to the river, at the proposed basin above Georgetown, or such other point above the same, as may be deemed best by the Corporation requiring such locks, not above the point indicated in the report of the General Committee, and as may be deemed most practicable and expedient by the President and Directors, (provided the several said Corporations assent to this resolution,) but so as not to interfere with the proposed abutment for the aqueduct for the canal to Alexandria.

And the said resolution was agreed to.

JO. GALES, Jr. Mayor,
Chairman.

J. P. INGLE, *Secretary.*

B

WASHINGTON, *October* 9, 1828.

SIR: A necessary absence of several weeks from this place, has prevented me from receiving, until a day or two ago, your letter of the 23d ult. inclosing for my opinion a resolution of the Chesapeake and Ohio Canal Compa-

ny: and, understanding the case to be one of some urgency, I have proceeded, with the least possible delay, to the examination of the subject.

The question which I understand to be submitted for my opinion, is, whether the charter of the company confers authority to extend the eastern section of the canal to tide water at the mouth of Rock Creek, or the mouth of Tiber Creek, according to the plan submitted to the company by the Engineers, Messrs. Wright and Martineau; the opposite opinion being, as I understand, that, by the charter, the canal must stop at the head of tide water on the Potomac.

After a careful examination of the several legislative acts which compose the charter of the company, I find nothing specific on this precise point. None of the acts refer to any report or plan for a specification of the route of the canal. The *termini*, as described by the acts, are far from precise; and the intermediate points, given by those acts, are too few and distant to throw any useful light on the question. Yet it is only from the language of the Legislatures, compared with the nature of the case, that we can collect their meaning.

The act of Virginia, of the 27th of January, 1824, which is the leading and original act on the subject, and which has been adopted, with modifications, by the other Legislatures, announces, in the preamble, the object of the incorporation to be, to establish "*a navigable canal from the tide water of the Potomac, in the District of Columbia*, to the mouth of Savage Creek on the north branch of said river; and extending thence, across the Alleghany mountains, to some convenient point of the navigable waters of the river Ohio, or some one of its tributary streams."

The 20th section of the act provides, "that the canal shall be divided into two sections, to be denominated first and second, or eastern or western, respectively; that the first or eastern section shall *begin* AT the District of Columbia, *on tide water*, and terminate at or near the bank of Savage river, &c."

Thus the beginning, given by the preamble, is, "*the tide water of the river Potomac*, IN *the District of Columbia*;" clearly assuming some point *within* the District, on tide water, without any other designation of the point than that it shall be *on tide water*, and *within the District*.

The 20th section describes the beginning to be "AT *the District of Columbia*, on tide water." This word "AT," might be construed to mean "*at the outer limit of the District, on tide water*," so as to exclude the District altogether. But this construction could not be maintained.

1st. Because the highest flow of the tide stops within the District, and the canal, consequently, could not commence on tide water, without commencing within the limits of the District.

2d. The consent of Congress, called for by the 1st and 14th sections of the act, is placed by the 23d section on the admission that the canal would necessarily run, in part, through the District, the exclusive legislation over which belonged to Congress.

3d. The Potomac Company, in order to take the benefit of the participation tendered to them by the act, are required to convey to the Chesapeake and Ohio Company their works, *which lay partly within the District*, and these works are required to be kept up by the latter company, until the Chesapeake and Ohio Canal shall be so far advanced as to supersede the use of them; manifestly indicating that the new canal should be at least co-extensive with works of the Potomac Company, and consequently extend within the District.

4th. The preamble expressly describes the canal as extending from the tide water *in* the District; and it is quite apparent from the whole scope and provisions of the act, that the eastern section was contemplated as beginning *within* the District.

The words "at the District of Columbia," in the 20th section, cannot, therefore, be interpreted as giving a beginning at the outer limit of the District, and exclusive of the District; but as necessarily inclusive of the District, and consequently as opening the whole District to the judgment of the company for the point of beginning, because no specific point within the District is designated; the only other descriptive circumstance, "*on tide water*," covering the whole extent of the flow of the tide within the District.

Thus the description in the preamble, and that in the 20th section, are in perfect harmony. All that is required by either, is that the canal shall begin from tide water within the District of Columbia. The language is not "*from the head of tide water*," which it would have been very easy to have said, if such had been the intention of the Legislature; and which ought to have been said, and, it is fairly to be presumed, would have been said, if such had been their intention. Because nothing can be farther removed from the expression of any such precise and definite intention, than the vague and general language which they have used, "from the tide water of the Potomac in the District of Columbia," and "beginning at the District of Columbia, *on tide water*." It is not conceivable that language, so loose and general as this, would have been selected by men of even ordinary accuracy of intellect, to convey an idea so exact as "*the head of tide water*," or "*the highest point to which the tide flows in the Potomac.*" This is certainly not the idea which is expressed: on the contrary, the language is so broad as manifestly to open the whole extent of the tide water of the Potomac, within the limits of the District, to the choice of the company for their place of beginning: and a Legislature is not to be considered as saying one thing, and meaning another and a different thing.

It is true, that if their language be so ambiguous as to be equally susceptible of two constructions, that shall be preferred which will best promote the avowed object of the law. But I apprehend that there is no ambiguity here. The language, though general, is not ambiguous. On the contrary, its generality is well explained by the nature of the case, and was manifestly intended. It arose necessarily from the nature of the case that it should be thus general: and it was, I think, properly made thus general, because its being so made *would best promote the great object of the law.*

What was the great object of the law? The preamble answers the question. It was to open a communication between the eastern and western waters; between the tide water of the Potomac, in the District of Columbia, and the navigable waters of the Ohio. The work contemplated was a great national work, and for great national objects. It did not look to little ends, and least of all, to the local rivalries that might arise between particular spots along the line of the canal. It proposed nothing so minute and invidious as to foster one spot in preference to another. It aimed at higher purposes. It dealt with States, not with villages. It looked to great political results; the consolidation and perpetuation of the Union by promoting the agricultural, commercial, and manufacturing interests

of those vast masses, the western and eastern sections of the continent. It was not the good of a few, therefore, much less of a handful, that it contemplated, but the good of the whole, so far as this good stood connected with this vast channel of communication between the East and the West.

In the language of the preamble of the law, it proposed, by means of this great channel of trade, "to extend and multiply the means and facilities of internal commerce and personal intercourse between the two great sections of the United States, and to interweave more closely all the mutual interests and affections that are calculated to consolidate and perpetuate the vital principles of the Union."

With these great objects in view, what was there to tempt the Legislature of Virginia to indicate any one particular spot in the District of Columbia for the commencement of the work, in preference to another? Was it in the spirit of so vast and beneficent a project to descend to any thing so minute as a designation of the precise spot at which the canal should commence? Was it not, on the contrary, entirely within the spirit of the project, and all sufficient for its purposes, that the Legislature should indicate, *in general terms*, the two great *termini* of the work, as, for instance, that the canal should connect and chain together the navigable waters of the Ohio with the tide waters of the Potomac, within the District of Columbia? It was wholly immaterial to this great purpose, whether the canal should begin at the head of tide water in the District, or one, two, three, four, five, or six miles below it. The great objects of the law would be equally accomplished, whether the canal should strike the tide water at its head or in the middle of the District, or any where else within its limits.

Again. Was the Legislature of Virginia in a condition to designate, to advantage, the precise point in the District at which the canal should set out? Had they the information necessary to this selection? A general geographical knowledge of the country was not sufficient for the purpose. The best point of beginning depended on a comparison of the difficulties which were to be overcome above. This required topographical surveys to be made by skilful engineers, a minute knowledge of details, a comparison of routes, and of their respective advantages and disadvantages, the power of experimenting on the soil, and rock to be excavated and removed, and the power of changing the route whenever experience should dictate such a change. The Legislature of Virginia well knew, what was known to the public at large, that from the natural obstacles to be encountered, the work would be attended with difficulties. It was highly problematical, at that time, whether a practicable route for a canal, through the whole distance, could be found at all. The law of Virginia, and the laws of the other States confirming it, contain the evidence of this doubt. At best, it was well known, that, in choosing a route, the measure would be attended with most extensive and complicated calculations. A practicable route was first to be ascertained, then, if there was a choice, the best and cheapest; and that which would promote the greatest number of interests was to be chosen. It was easy to foresee that the only practicable route might strike the tide water below its head: the best and cheapest might strike it still lower. To the great objects of the work it was perfectly immaterial at what precise point it should strike the tide water, provided that it should strike it somewhere within the District of Columbia. In a case like this, demanding such minute and accurate surveys, such a personal, laborious, and careful examination of the ground,

such an intimate knowledge of the whole details, connected with the entire route of the canal, and this with the aid of skilful and practical engineers, it seems to me most unreasonable to suppose that a Legislature, passing a law like this, should, *without any adequate motive*, peremptorily direct that the canal should begin at the head of tide water, and no where else. For, suppose that it should be ascertained that the only practicable route would conduct the canal one, two, three, or more miles below the head of tide water; is it conceivable that the Legislature would recal the charter, or direct the work (such a work as this) to be abandoned, because it had been found impracticable to strike the head of tide water, an object so manifestly immaterial to the great purposes of the project? Is it not equally irrational to suppose that a Legislature, necessarily ignorant of all the details on which the selection of the best point of beginning depended, should nevertheless proceed to select that beginning, and leave the company to overcome, as they could, the increased difficulties that might be thrown upon them from such a choice? Is it not far more rational to suppose that a Legislature, so circumstanced, and with a great object like this in view, would content themselves with a designation in general terms of the great *termini* of the canal, and leave to the company, who possessed every advantage for the purpose, the selection of the particular point at which the canal should set out?

This, it seems to me, is what they have done. The western *terminus* is *the highest point of steamboat navigation on the Ohio, or any of its tributary streams:* the eastern *terminus* is *the tide water of the Potomac in the District of Columbia*, that is, *in the whole District.* The rest is committed to the judgment of the company. And to enable them to exercise their judgment to advantage, the fourth section of the law provides, "that the President and Directors, &c. shall have full power and authority to appoint, and at their pleasure dismiss, *such engineer or engineers*, and agent or agents, as they may deem expedient, &c.; and to agree with any person or persons, on behalf of the said Company, to cut canals, erect dams, open feeders, construct locks, *and perform such other works as they shall judge necessary or expedient for completing the canal herein before mentioned and described:*" but what canal had been therein before mentioned and described? None other than "*a navigable canal from the tide water of the river Potomac, in the District of Columbia*, to the mouth of Savage Creek, on the north branch of said river, and extending thence across the Alleghany mountain, *to some convenient point of the navigable waters of the river Ohio, or some one of its tributary streams.*"

It seems to me, therefore, that it is but to look at the nature of the case, and the state of information possessed by the Legislature, to discover that the general terms in which the two *termini* of the canal are described, were intentionally, and, indeed, unavoidably used by the Legislature, and that their purpose was the very natural and necessary one of leaving to the judgment and discretion of the company, with the aid of their engineers, the selection of the precise points of beginning and termination, as well as the selection of the precise route of the canal, on which those points so materially depended.

This opinion derives confirmation from what I understand to have been the practical exposition of the much stronger terms used in the charter to the Potomac company, and this exposition sanctioned by repeated acts of the Legislatures of Virginia and Maryland, from which that charter flow-

ed. The object of that charter is stated in the preamble to the Virginia act of 1784, in these words, "Whereas the extension of the navigation of Potomac river, *from tide water* to the highest place practicable on the north branch, will be of great utility, &c.;" and the power given to the company, in the fourth section of the act, is "to cut such canals, and erect such locks, and perform such other works, as they shall judge necessary for opening, improving, and extending the navigation of the said river, *above tide-water*, to the highest part of the north branch to which navigation can be extended, &c." Now, it is to be observed that the object of this law is comparatively a limited one: it is the improvement of the navigation of the Potomac river. The district of country to be accommodated was comparatively small: it was the mere neighborhood of the Potomac. The power given, is to extend the navigation *above tide water*. There was good color here for insisting that the works should begin at the head of tide water. Yet I understand the fact to be that the works of the Potomac company extended a mile, at least, below the head of tide water. Laws like these are not to be construed strictly and according to the letter, but *reasonably, and with reference to the nature of the subject*, and *liberally* to *advance the great and paramount objects which they contemplate*. For this reason, no complaint has ever been made that the Potomac company have violated their charter in this respect.

It appears to me that farther support is given to the opinion which I have expressed, that it was not the intention of the Legislatures to restrict the beginning of the canal to the head of tide water, by a proviso in the act of Congress, of the 24th May, 1828, authorizing a subscription to the stock of the Chesapeake and Ohio Canal, "which provides, that, for "the supply of water to such other canals as the State of Maryland or "Virginia, or the Congress of the United States, may authorize to be "constructed, in connexion with the Chesapeake and Ohio Canal, the "section of the said canal leading from the head of the Little Falls of the "Potomac river, *to the proposed basin, next above Georgetown, in the Dis-"trict of Columbia*, shall have the elevation above the tide of the river at "the head of the said Falls, and shall preserve, throughout the whole sec-"tion aforesaid, a breadth, at the surface of the water, of not less than "sixty feet, and a depth below the same, of not less than five feet, with a "suitable breadth at bottom." So far, then, as Congress is concerned, the understanding was, that the Chesapeake and Ohio Canal should extend at least to *the proposed basin above Georgetown;* which, I learn by public documents, is a considerable distance, perhaps two miles, below the present locks of the Potomac Company, and consequently farther still below the head of tide water; which is proof demonstrative that the canal was not intended, by this body, to terminate at the head or highest point of tide water.

It is proper, farther, to observe, that while the *proviso* requires the canal to be brought to the *basin above Georgetown*, at an elevation equal to the height of the water in the river at the head of the Falls, there is no intimation of an intention that the canal shall stop at that basin, and shall be thence locked down to the tide water at that point. On the contrary, the *proviso* was made with a totally different aspect, and has no relation to the termination of the canal. The purpose of the *proviso* is explained by the conditions on which the States of Maryland and Virginia had given their assent to the establishment of the Chesapeake and Ohio Canal; to wit,

that they should have the right to run off lateral canals from the main stem, into their respective States. The State of Maryland, particularly, claimed the right of taking off a branch to the waters of the Patapsco; and the report of her engineer, Dr. Howard, had ascertained that this could only be done by bringing down the water into the basin above Georgetown, at an elevation of not less than twenty-five or thirty feet above the level of the tide. It was to secure this great object to the State of Maryland, that this *proviso* was introduced into the act of Congress, and with no reference whatever to the ultimate termination of the canal at the proposed basin above Georgetown. So that this proviso, while it entirely defeats the construction which requires the canal to terminate at the head of tide water, presents no conflict with the opinion which I have had the honor to express.

Upon the whole, Sir, it seems to me that the resolution of the Chesapeake and Ohio Canal Company, which you have submitted for my consideration, is perfectly within the chartered powers of the Company.

I have the honor to remain, very respectfully,

Your obedient servant,

WM. WIRT.

CHARLES FENTON MERCER, Esq.

Pres. Ches. and Ohio Canal Co., Washington.

(C.)

The following are the Resolutions as amended by the Committee, and finally passed by a unanimous vote of the Convention.

Whereas a connection of the Atlantic and Western Waters, by a Canal leading from the Seat of the General Government to the river Ohio, regarded as a local object, is one of the highest importance to the States immediately interested therein, and, considered in a national view, is of inestimable consequence to the future union, security, and happiness, of the United States:

1. *Resolved, unanimously,* That it is expedient to substitute for the present defective navigation of the Potomac river above tide water, a navigable canal, by Cumberland, to the mouth of Savage creek, at the eastern base of the Alleghany, and to extend such canal, as soon thereafter as practicable, to the highest constant steam boat navigation of the Monongahela or Ohio river.

That the most eligible mode of attaining this object will be by the incorporation of a joint stock company, empowered to cut the said canal through the territory of the United States, in the District of Columbia, and of the States of Virginia, Maryland, and Pennsylvania; and, therefore, that committees be appointed, each consisting of five delegates, to prepare and present, in behalf of this Assembly, and in co-operation with the Central Committee, herein after provided, suitable memorials to the Congress of the United States and the Legislatures of the several States before named, requesting their concurrence in the incorporation of such a company, and their co-operation, if necessary, in the subscription of funds for the completion of the said canal.

And whereas, by an act of the General Assembly of Virginia, which passed the 22d February, 1823, entitled "An act incorporating the Potomac Canal Company," the assent of that State, so far as the limits of her territory render it necessary, is already given to this *object*; and for *its* enlargement, to the extent required by the preceding resolution, the said act appears to furnish, with proper amendments, a sufficient basis:

Be it, therefore, resolved, That it will be expedient to accept the same as a charter for the proposed company, with the following modifications, viz:

That, in reference to its enlarged purpose, the name be changed to "The Chesapeake and Ohio Canal."

That provision be made for the assent of the Government of the United States, and of the State of Pennsylvania, to the said act, and that the act be made to correspond in its details with such provision.

That the Chesapeake and Ohio Canal shall be divided into two sections, eastern and western; the former of which shall correspond in description with that of the Chesapeake and Ohio Canal by the preceding resolution; and the latter shall begin at the western extremity of the former, and terminate at the head of the steam boat navigation of the Monongahela or Ohio river.

That, while the act shall allow a reasonable time for the commencement and the completion of both sections of the canal, no other forfeiture shall be incurred, after the eastern section is finished, for a failure to begin or complete the western section, within the term prescribed, except of the right to complete such section, and of all interest therein.

That, while the consent of Pennsylvania is provided for, in the amended act, it shall not be indispensably requisite to the validity of the charter, so far as respects the authority granted by it, to extend the Chesapeake and Ohio Canal to the Pennsylvania line.

That it will be both just and expedient, if not absolutely necessary, to limit the interest of the stockholders of the Potomac Company, in the stock of the Chesapeake and Ohio Canal, in the mode provided by the unanimous resolution of the company of the 7th day of February last, a copy of which is hereto annexed.

That the said canal shall not, in width, be less at the surface than 40 feet, at its bottom than 28, nor its depth of water be short of four feet, except where, from the nature of the ground, it may be necessary, for the greater security of the banks of the canal, to reduce its breadth at its base to less than 28 feet.

That the maximum profit of the said company shall not exceed 15 per cent. after the entire canal shall have been completed; but if, at any time after the completion of the eastern section thereof, and before sufficient funds shall have been otherwise provided for the completion of the western, the tolls of the canal shall yield a nett income to the stockholders, excepting 10 per cent. per annum, such excess shall be applied towards the extension of the canal, until the western section shall have been completed; and, to give more speedy effect to this provision, the President and Directors of the Chesapeake and Ohio Canal Company shall be authorized to borrow, or may negotiate, through a suitable agency, in behalf of the company, on the credit of such excess, or on the tolls, or a fixed part thereof, levied upon certain commodities passing through the said canal, being the probable amount of such annual excess, such sums of money as may be deemed expedient, by a general meeting of the stockholders, to be

applied to the extension of the western section of the canal, from time to time, till the said section shall have been completed. And if, after the completion of the entire canal, the nett dividends shall exceed 15 per cent. per annum, such excess shall be applied, first, to strengthening the works of the canal, next, to the multiplication of ascending locks from the river Potomac to the level of the canal, wherever the convenience of the adjacent country may require it; next, to lining the canal throughout with such walls of stone as shall accommodate its banks to the use of steam boats; and should the nett dividends still exceed 15 per cent., then such excess shall be applied to the reduction of the tolls upon the said canal, according to some equitable scale.

That the act aforesaid be amended, by inserting, in lieu of the 18th section thereof, the following:

"*And be it further enacted*, That the right to the waters of the river Potomac, for the purpose of any lateral canal or canals, which the State of Virginia or Maryland may authorise to be made, in connexion with the said canal, is reserved to the said States respectively: That a similar right is reserved to the State of Pennsylvania, in relation to the rivers and streams within the territory of that State, the waters of which may be used in supplying the western section of the said Canal: That the Government of the United States shall retain the power to extend the said canal in or through the District of Columbia, on either or both sides of the river Potomac: And the State of Maryland or Virginia shall be empowered, under the sanction given by the United States to this act, to authorize any such extension, for the purpose of meeting any canal, so extended, by any other canal, which either State may deem it expedient to conduct, in any direction whatever, through its territory.

Provided, however, That no part of the waters of the river Potomac, or of any other river or stream, required to ensure the constant, safe, and convenient use of the navigation of the canal hereby authorized to be made, shall be, by any such lateral or continued canal, diverted therefrom, to the impediment or injury of the said navigation."

2. *And be it further resolved*, That, in addition to the provision contained in the first section of the act aforesaid, there be grounded on the event of its failure to furnish adequate funds for the completion of the eastern section of the canal, to be obtained through separate acts of the respective Governments and Corporations, of the States of Maryland and Virginia, of the United States, and of the three cities of the District of Columbia, a subscription to the amount, if necessary, of 2,750,000 dollars, in the following proportions; 2-11ths to be subscribed by the State of Maryland, 3-11ths by the State of Virginia, 4-11ths by the United States, and 2-11ths by the District cities; to be divided between them, according to an equitable ratio, to be fixed by themselves. In case a part of the sum aforesaid shall be subscribed by private individuals, in the mode provided by the act aforesaid, the several States and Corporations, within which such individual subscriptions are received, shall be requested to assume, as part of their aforesaid quotas, the amount of such subscription, under such security as they may deem expedient for the payment thereof, by the subscribers, to them respectively:

That the Government of the United States be earnestly solicited to obtain the whole of this sum on loan, receivable in four annual instalments, upon the issue of certificates of stock, bearing an annual interest not ex-

ceeding five per cent. and irredeemable for thirty years, and to guaranty the repayment thereof on a specific pledge of the public lots in the City of Washington, of the United States' stock in the canal, and the public faith.

That the first instalment of the loan be made payable on the 1st of March, 1825, and the last on the 1st of March, 1829.

That the interest of each State and Corporation, upon its proportion of the said loan, be paid into the Treasury of the United States, according to the terms of the loan, and the principal sum at the expiration of thirty years, the period to be fixed for its redemption.

That, in the event of a refusal by the Government of the United States to negotiate the said loan, each State and Corporation shall provide the amount of its respective subscription, in such manner as may seem to it best.

3. *And be it further resolved*, That a committee of five delegates be appointed to prepare, and cause to be presented, in behalf of this Convention, a suitable memorial to the State of Ohio, soliciting the co-operation of that State in the completion of the Chesapeake and Ohio Canal, and its ultimate connexion with the navigation of Lake Erie; and that, for the latter purpose, the memorial shall respectfully suggest the expediency of causing the country between the northernmost bend of the river Ohio and the southern shore of Lake Erie, together with the waters of Great Beaver and Cayuga Creeks, and all other intervening waters near the said route, to be carefully surveyed, with the view of ascertaining the practicability and probable cost of a canal, which, fed by the latter, shall connect the former.

That a letter be addressed by the Chairman of the Convention to the Mayor's of Alexandria, Georgetown, and Washington, apprising, through them, their respective Corporations, of the proceedings of this Convention, and inviting their zealous co-operation in giving to them effect.

That another letter be addressed by the Chairman, in behalf of this Convention, to the President and Directors of the Potomac Company, requesting their concurrence in the measures recommended by the preceding resolutions.

4. *And be it further resolved*, That the committees before named be, and they are hereby, authorized and requested to use their best exertions to obtain the most favorable reception for their memorials, to ascertain and communicate to the Central Corresponding Committee, hereinafter named, such objections, if any, as are opposed to the prayers of their respective memorials, and to devise, if possible, in conjunction with the common friends of the Union and prosperity of the United States, the means of obviating all the impediments to their success.

5. *And be it further resolved*, That, for the last mentioned purpose, the Delegates of the respective counties and corporations, represented in this Convention, be regarded also as corresponding committees, and that 13 delegates be appointed a central committee of correspondence, to confer with the committees before named, and to hold stated meetings in the City of Washington, for the purpose of consulting upon, and adopting in behalf of the Chesapeake and Ohio Canal, such measures as may seem best calculated to assure its certain and speedy completion.

JOSEPH KENT, *Chairman.*

WALTER JONES, *Secretary.*

(D.)

Extract from the President's message of the 15th of December, 1802.

"Presuming it will be deemed expedient to expend annually a convenient sum towards providing the naval defence which our situation may require, I cannot but recommend that the first appropriations for that purpose may go to the saving what we already possess. No cares, no attentions, can preserve vessels from rapid decay, which lie in water, and exposed to the sun. These decays require great and constant repairs, and will consume, if continued, a great portion of the moneys destined to naval purposes. To avoid this waste of our resources, it is proposed to add to our navy yard here a dock, within which our present vessels may be laid up dry, and under cover from the sun. Under these circumstances, experience proves that works of wood will remain scarcely at all affected by time. The great abundance of running water which this situation possesses, at heights far above the level of the tide, if employed as is practised for lock navigation, furnishes the means for raising and laying up our vessels on a dry and sheltered bed. And should the measure be found useful here, similar depositories for laying up, as well as for building and repairing vessels, may hereafter be undertaken at other navy yards, offering the same means. The plans and estimates of the work, prepared by a person of skill and experience, will be presented to you without delay; and from these it will be seen that scarcely more than has been the cost of one vessel is necessary to save the whole, and that the annual sum to be employed towards its completion may be adapted to the views of the Legislature as to naval expenditure."

Copy of the President's subsequent message of the 28th of Dec. 1802.

Gentlemen of the Senate, and of the House of Representatives:

In my message of the 15th instant, I mentioned that plans and estimates of a dry dock, for the preservation of our ships of war, prepared by a person of skill and experience, should be laid before you without delay; these are now transmitted; the report and estimate by duplicates; but the plans being single only, I must request an intercommunication of them between the houses, and their return when they shall no longer be wanting for their consideration.

TH. JEFFERSON.

December 27th, 1802.

Extract from the letter of the Secretary of the Navy, of the 3th of Dec. 1802.

"I have the honor to enclose two copies of a report, made to me by B. H. Latrobe. Esq., on the subject of a dry dock, at this place, of a size sufficient to contain twelve frigates of 44 guns, in which report he mentions the site that would, in his opinion, be the best; the works necessary to be erected, accompanied by drawings; the means of supplying the dock with water; and the probable period it would take to complete the works; to which he has subjoined the necessary estimates, exhibiting the probable cost."

Extract from the letter of B. H. Latrobe to the Secretary of the Navy, dated December 4th, 1802.

"Site of a Dry Dock or Naval Arsenal.

"The harbor of the Eastern Branch of the Potomac has, in almost every part, a bottom of mud, into which the wharves which have been erected sink to a great depth, and which affords in very few places a prospect of a good building foundation at a moderate depth and expense. But at the end of the street marked 9, east of the capitol, which bounds the navy yard to the east, a spot of hard gravel runs out near to the channel, which promises to furnish a solid foundation for the erection of the first lock necessary to raise the ships into the dock. Another circumstance points out this spot as advantageous: A valley runs up in the direction of the street, the greatest part of the distance to which the works must be extended. This will save more than half of the digging which would otherwise be necessary. To render the situation as advantageous as possible, it will be requisite that the streets should be vacated so far as the square in which the Virginia and Georgia avenues intersect each other, and to purchase the squares east of the street No. 9, as far as No. 10. But should any objection occur to the vacating of the streets to such an extent, or to the terms on which the lots could be purchased, the plan herewith submitted may be executed at nearly the same estimated expense by vacating the streets only to the extent of the navy yard, according to its present limits, and by placing the arsenal at right angles with the locks, extending the same from east to west. A circle is marked on the plan, representing a turning dock, which would also be useful as a repairing and graving dock for three frigates, if necessary to execute the same. Its expense is included in the estimate herewith submitted. Should this mode of executing the plan be adopted, it will render the purchase of only 100 feet by 250 feet necessary, to the eastward of the street No. 9, at the distance of about 400 feet from the present shore. As however this plan has many disadvantages, it will be to be considered in how far the present purchase of the eastern squares could be effected by the sum which the erection of the turning dock will require; for if the arsenal be in a line with the locks, the erection of the turning dock may be well postponed until the extension of the arsenal or the construction of repairing or graving docks be found necessary. And should great part of the navy yard be occupied by the arsenal, the space which ought to be open for the erection of store houses, will not only be much curtailed, but their situation deteriorated. If the eastern squares be obtained, a range of store houses, east of the locks, will not only enclose and protect the works, but be in the most advantageous situation for the delivery of the stores to the ships as they arrive from the arsenal at the pier heads. For the perfect comprehension of the situation, I beg to refer to the maps of the city."

"Works necessary to be erected.

"The first works to be erected are two locks of 12 feet lift each. The lowest of these locks being sunk 23 feet below high water, receives the ship from the channel of the harbor. The lower gates being shut, the lock is filled by water from the upper lock until it rises to the height of 12 feet above high water, at which level the vessel will find 23 feet of water in the upper lock, into which she then enters. The water in the

upper lock being then raised 12 feet higher, the vessels will be admitted to the dry dock or arsenal into 23 feet of water. Her keel being then (if she draw 23 feet) one foot above high water mark. Whenever the number of vessels intended to be docked or laid up have been raised into the dry dock by this process (which is more fully explained by the model which I shall in a few days submit to you) all the water is permitted to discharge itself into the harbor, and the vessels being properly shored as the water leaves them, settle upon the blocks which are prepared upon the slips marked in the drawing No. 2, fig. 1. It is very evident, to use the words of the President's letter to me, "that a vessel thus secured from the weather from above, and placed with her keel one foot above high water mark, may be perfectly drained, and rendered as safe against decay as the internal timbers of a house." In order to get rid of the foul air which is the most rapid cause of rot, and also perfectly to drain the vessels, it may be necessary, on laying them up, to take off one streak on each side, on each floor below the gun deck, from stem to stern. In this dock a vessel may be built or repaired at leisure: a single vessel may be docked for repair between the dry dock and the locks, without filling the dry dock.

The naval arsenal, as appears by the drawing hereto annexed, is to be so constructed as to admit the free passage of the air from every quarter. It was essential that it should be permanent in its mode of construction, and secure from fire. The walls are therefore of solid masonry. For so extensive a span without a pillar, no better roof could be adopted than that recommended by the President, and of which he has furnished me with the model, namely, that of the Hal au bled or corn market at Paris; and, of incombustible roofs, that covered with painted or varnished sheet iron is certainly the cheapest, and I think the best. The drawings and estimates are therefore calculated for such a building and roof. As to the ornamental parts of the design, they are not included in the estimate, nor are they within the compass of the arts in America at present."

"The means of supplying the Dock with water.

"In the letter of the President to me, two modes of supplying the dock with water were submitted to examination. 1. From the Potomac canal. 2. From the Tiber.

1. There cannot be one moment's hesitation as to the abstract merits of each of these methods of supply. The Potomac canal may be brought by continuation from the locks at the Little Falls through Georgetown to Rocky Creek, and through the City to the navy yard. This canal would not only fill all the works in twelve hours, but convey to the navy yard all the timber, stores, and provisions which the whole range of the upper navigation of the Potomac could supply, comprehending not only a great part of Virginia and Maryland, but also a very considerable portion of the most fertile western counties of Pennsylvania. To this part of the subject I have paid particular attention, and have fully digested a plan which appears to me the best, and perhaps, under all the circumstances of the property and the levels of the ground in the city, the only feasible means of accomplishing such a navigation. Being, however, instructed by the President to separate the consideration of this project from my present report, on account of its large expense, I will only mention here, that the plan of a company, either by way of extension of the old Potomac Canal Company, or of a new company for this separate object, has been suggested, which, if formed under the sanction of the Legislature, would give to the nation all

its advantages, both as to the docks and the supply of stores, on no worse terms than those on which private citizens would obtain its commercial facilities."

Extract from a letter of Thomas Tingey of October 22d, 1802.

"The distance between the canal at the Little Falls and the navy yard, as the race would be obliged to course, would be eight miles, making use of aqueducts to convey the water over the stream at Mr. Foxall's furnace, over Rock Creek, and over the Tyber near the Capitol: namely, two miles and seven-eighths from the locks to Rock Creek bridge; and thence five miles and one-eighth through the city to the navy yard.

"The season, as is before intimated, was, at the time this survey was taken, extremely dry, and the quantity of water in the Little Falls canal consequently small. Not so high by two feet as when the boats pass along it. Thus, allowing for dry seasons, the height of this canal above high water may not be reckoned more than twenty-nine feet, for the purposes contemplated by this survey."

[By recent survey, the height of the water of the Potomac at the Little Falls is found to be thirty-seven feet above the high tide. The tide rises about four feet.]

Extract from a letter of B. H. Latrobe to the President, dated Dec. 15, 1802.

"SIR: Captain Dale, of the United States' Navy, called upon me this morning, and in conversation upon the naval arsenal or dry docks proposed by you to be erected at the Federal City, which he most warmly approved, he informed me that the Swedish Government had lately conceived the idea of adopting the same means of preserving their navy in times of peace. The Swedish Admiral Soderstrom described to him the situation of the dock, which was then in the progress of construction. It was intended to contain eight ships of 74 guns, and another was projected to contain twelve; in all, making provision for 20 ships of the line. The situation was remarkably favorable. Deep water close to a perpendicular rock, which can be easily wrought, gives the opportunity of excavating the dock: the rock forms the wall, and the roof is laid over, at such a height, that the ships go in with their lower masts standing. Captain Dale did not exactly know how the ships were worked into the dock, but from his description of the situation I presume they are tide-docks. Admiral Soderstrom said that the vessels were to be washed with fresh water, perfectly drained, and opened to a circulation of air; and that he had no doubt of their remaining in perfect repair in the dock for a century, and gave many reasons for his opinion, which were convincing."

Docks for the construction and repair of ships of war are now constructing in several parts of the United States. That the policy on which they are grounded is almost coeval with the American Navy, is evinced by the act of February, 1799, authorizing the establishment of two docks for the convenience of repairing the public ships and vessels in suitable places, under the direction of the President of the United States, and appropriating 50,000 dollars to that object.

The act was never repealed, but the appropriation was allowed to expire.

In 1802, the subject was revived in the councils of the nation, as will appear from the annexed extracts from the public documents of that year; and the Eastern Branch recommended as a suitable position for one of those docks.

20th Congress, 2d Session. [Doc. No. 127.] Ho. of Reps.

MEMORIAL

OF THE

CHESAPEAKE AND OHIO CANAL COMPANY.

February 23, 1829.—Read, and laid upon the table.

To the Senate and House of Representatives of the United States of America in Congress assembled:

The memorial of the President and Directors of the Chesapeake and Ohio Canal Company,

Most respectfully represents:

That they have heard with great concern that the enterprise confided to their care by the stockholders of the company, among whom they have the honor to comprehend the United States, has been represented to be, in part at least, impracticable.

Your memorialists have been informed, and believe that those representations refer to the portion of their undertaking which is expected to connect the Potomac, at or above Cumberland, with the navigable waters of the west, at Pittsburg: and they are apprised of the assertion that there will not be water to supply this part of the canal, and that the expense of its application, by a tunnel through the Alleghany, has been exaggerated and represented to be the only means of accomplishing the great end which they are empowered to pursue.

In reply to these objections, your memorialists beg leave to refer to the message of the President of the United States, of the 7th December, 1826, to both Houses of Congress, transmitting the report of the United States' Board of Internal Improvement, concerning the practicability, the plan, and the route of the Chesapeake and Ohio Canal; to which your memorialists now add the accompanying letter from the chief of that Board.

Whilst they totally disclaim any unfriendly feeling towards the public spirited enterprise of the Baltimore and Ohio Rail Road Company, and equally disavow any pretension, on their part, to intercept the bounty of Congress towards any object whatever, they cannot permit their silence, under existing circumstances, to imply an abandonment, on their part, of the rights of the Chesapeake and Ohio Canal Company: and they beg leave to ask of you an examination of the second section of the act of the State of Maryland, passed at the December session of 1826 of her General Assembly, entitled "An act to amend the act incorporating the Chesapeake and Ohio Canal Company," which, having been passed in conformity with the fourth section of an act of the Legislature of

Pennsylvania, of the 9th February, 1826, entitled "An act incorporating the Chesapeake and Ohio Canal Company," and having been subsequently confirmed by correspondent acts of the General Assembly of Virginia, and of the Congress of the United States, bearing date respectively the 26th February, 1827, and 23d of May, 1828, of all which acts complete copies or extracts therefrom are hereto annexed, became part of the charter of the Chesapeake and Ohio Canal Company, and granted to them authority "to terminate the eastern section of the said canal at or near the town of Cumberland on the river Potomac, and to extend the western section thereof, in any direction that may be deemed expedient, by any other route as well as that prescribed in the act aforesaid, (being an act incorporating the Chesapeake and Ohio Canal Company,) towards Pittsburg, and in extending the same in any direction across the dividing ridge which separates the eastern and western waters, to substitute for a tunnel and numerous locks, on such part of the route, inclined planes and railways, *or any other artificial communication* or roads."

It is evident, from the terms of this authority, and especially those of the prior act of Pennsylvania, that the Chesapeake and Ohio Canal Company have full power, where an adequate supply of water to feed a canal between Cumberland and the navigable waters of the west may not exist, to construct a railway, and consequently part of the very railway which the Congress of the United States are invited to aid in constructing, with the funds of the nation, for the benefit of another company.

If aid for this object had not been solicited of your honorable body, under the authority of the Chesapeake and Ohio Canal Company, by your memorialists, it has been because, as yet, they have not been able to decide definitively on the expediency of constructing a continued canal, or a railway, on the "middle section (to use a denomination of the United States' Engineers.) of the Chesapeake and Ohio Canal; and because they have been desirous to furnish, by the actual construction of part of the eastern section of the canal, conclusive evidence that the whole can be made, on an enlarged plan, for a sum much less than that at which its cost was estimated, prior to the subscription to its stock by Congress of one million of dollars. By the next Winter this evidence will have been supplied, through the operation of the contracts already formed for the completion of forty-eight miles of the canal, being all that part of the eastern section which has been left open to execution, by the unexpected interference of the Baltimore and Ohio Rail Road Company with the route laid down by the United States' Board of Internal Improvement for that section, and approved by an examination, by order of the General Government, of the same route, by two eminent civil engineers of New York, Messrs. James Geddes and Nathan S. Roberts.

Your memorialists are aware that other routes may be designated for a railway from Cumberland to the river Ohio, at Pittsburg, besides that which may be chosen, after a thorough examination of the intermediate ground, by the Chesapeake and Ohio Canal Company: but your memorialists are not allowed, by any reference to experience, to confide in the probable selection by the Baltimore and Ohio Rail Road Company, of a route for their road which shall not interfere with the rights of this company, which are to "extend a branch canal up the Potomac, from Cumberland to the coal banks on that river, and to make a railway or canal from Cumberland towards Pittsburg, on any route they may please to select." It is from a sense of duty, and a sense of duty only, that your

memorialists are obliged to say that no interference by that company with either of those rights would be more injurious than the steps which they have already taken to arrest the progress of the Chesapeake and Ohio Canal, on its twice designated route, along the valley of the Potomac river.

Your memorialists did not interfere, in their individual capacity, when it was publicly announced that certain public spirited individuals in Maryland sought a charter of the States of Maryland and Virginia to construct a railway from Baltimore to the Ohio, because no interference with the charter, already obtained by much and long continued labor on the part of "the Chesapeake and Ohio Canal Convention," was apprehended. The gentlemen who asked the charter for a railway, disapproving of the circuitous route of the canal, directed the public attention to a wholly distinct path for their enterprise. While their contemplated railway preserved this character, the members of the Chesapeake and Ohio Canal Convention, and the Central Committee of that Convention, especially charged to watch over its interests, not only did not interfere with the wishes of the friends of the railway, but, as is known to your memorialists, favored their applications for a charter, both in Maryland and Virginia.

The accompanying extracts from the pamphlet first announcing the intended application for this charter illustrate and confirm the truth of this statement, and have an important bearing on the apprehensions of your memorialists.

If reference be had to the interest of the United States in the stock of the Chesapeake and Ohio Canal Company, and to the annexed terms of the charters of both companies, no reason will be found in their relative privileges, to prefer the claims of that which now seeks the aid of Congress.

The Congress of the United States having already authorized an investiture of one million of dollars in the Chesapeake and Ohio Canal, it is an act of duty on the part of your memorialists to the United States, as well as to the other stockholders of the Chesapeake and Ohio Canal Company, however reluctantly performed, in consequence of the desire of the memorialists to preserve that harmony which they have hitherto maintained between all the legitimate objects of internal improvement and that confided to their care, to ask of the Congress of the United States not to express in any mode an opinion upon the relative legal pretensions of the two companies.

By order and in behalf of the Board.

C. F. MERCER, *President.*

Copy of a letter from C. F. Mercer, President of the Chesapeake and Ohio Canal Company, to Gen. S. Bernard.

OFFICE OF THE CHESAPEAKE AND OHIO CANAL COMPANY,
Washington, February 21, 1829.

DEAR SIR: I beg leave to ask you, if my recollection be correct, of a conversation which I had with you and Capt. Poussin, of the corps of

Engineers, more than two years ago, in which, adverting to the expected supply of water at the summit level of the Chesapeake and Ohio Canal, you suggested to me your opinion in language to the following effect: that if, in your report to the Department of War, you had sought to avoid too favorable a view of our enterprise, and that if you had overrated the probable cost of the canal, you had as much underrated its supply of water at the summit level, or proposed tunnel through the Alleghany.

From the importance, in the present state of our enterprise, of the fact to which this conversation related, I will thank you, in behalf of the Board of Directors of the Chesapeake and Ohio Canal Company, to let me know whether my statement of it be correct. And if not, or any different impression in relation to this subject has since arisen in your mind, what should be the extent of our confidence in the supply of water afforded at that summit, for locking down the opposite valleys of the mountain, to the Youghiogeny and the Potomac rivers.

I have the honor to be, sir,
With high respect,
Your obedient servant,
C. F. MERCER,
President Ches. & Ohio Canal Company.

Gen. S. BERNARD,
Member of the Board of Internal Improvement.

WASHINGTON CITY,
February 21, 1829.

SIR: In answer to your letter, I have the honor to desire you to refer to the report of the Board of Internal Improvement, dated December 7, 1826. In that report it is distinctly stated, that the minimum quantity of water yielded by Casselman's river is sufficient to supply the summit level of the Chesapeake and Ohio Canal, as also its lockage for the maximum of trade.

Therefore, the Board have used in their calculations the elements of the smallest supply compared to those of the greatest expense.

I have the honor to be, sir,
Very respectfully,
Your humble servant,
BERNARD, *Brig. Gen.*

To the Hon. C. F. MERCER,
President of the Chesapeake and Ohio Canal Company, Washington City.

Extracts from the report of the Committee made and included in the proceedings of sundry citizens of Baltimore, convened for the purpose of devising the most effectual means of improving the intercourse between that city and the Western States.—Report made in February, 1827, pages 30 and 31.

"In conclusion, the committee beg leave to refer to the annexed tables, numbered from 1 to 7, in which they have arranged, under a condensed

form, some of the more important facts and statements embraced in this report. The committee have, also, in these tables, contrasted the advantages which, in their opinion, would be likely to accrue to the city of Baltimore from connecting her trade with the Western States by intersecting the contemplated Chesapeake and Ohio Canal, within the District of Columbia, and by *a direct rail road from Baltimore to some eligible point on the Ohio river.*

Names of the gentlemen composing the committee who made this report:

Philip E. Thomas,
Benjamin C. Howard,
George Brown,
Talbot Jones,
Joseph W. Patterson,
Evan Thomas,
John V. L. McMahon.

After the report of the committee had been read and approved, it was, among other things,

Resolved, That a committee, consisting of twenty-five members, be appointed by the chairman of this meeting, whose duty it shall be to prefer an application to the Legislature of Maryland for an act of incorporation.

The following committee was then appointed to carry into effect the object of the meeting, to wit:

Charles Carroll, of Carrollton
William Patterson
Isaac McKim
Robert Oliver
Charles Ridgely, of Hampton
Thomas Tenant
Alexander Brown
John McKim, jr.
Talbot Jones
James Wilson
Thomas Ellicott
George Hoffman
Philip E. Thomas
William Steuart
William Lorman
George Warner
Benj. C. Howard
Solomon Etting
W. W. Taylor
Alexander Fridge
James L. Hawkins
John B. Morris
Luke Tiernan
Alexander McDonald
Solomon Birkhead.

The following gentlemen compose the Board of President and Directors of the Baltimore and Ohio Rail Road Company.

Philip E. Thomas, *President*
Charles Carroll, of Carrollton
William Patterson
Robert Oliver
Alexander Brown
George Hoffman
Alexander Fridge
William Lorman
John B. Morris
Isaac McKim
Patrick Macauly
William Steuart
Solomon Etting
Talbot Jones.

Appendix to the preceding report.

TABLE No. 1.

Estimated difference in the distance, between connecting the city of Baltimore with the Western trade, by a continuous canal, intersecting the east-

ern termination of the proposed Chesapeake and Ohio Canal, within the District of Columbia, and of connecting Baltimore with this trade by a railway, direct from that city to some suitable point on the Ohio river.

The United States' Engineers report the length of the Chesapeake and Ohio Canal, from the city of Washington to Pittsburg, on the Ohio river, to be - - - - - - - -	341½ miles.
Estimated length of a canal from Baltimore to intersect the Chesapeake and Ohio Canal at Washington, - -	48½ miles.
Whole distance of a canal by this route, from Baltimore to Pittsburg - - - - - - -	390
Estimated distance of a rail road from the city of Baltimore to Wheeling, or some other suitable point on the Ohio river,	250
Distance saved by a rail road -	140 miles.

Table No. 2.

Comparative cost of constructing a canal communication between the city of Baltimore and the Ohio river, by the proposed route of the Chesapeake and Ohio Canal, and by the proposed direct rail road communication between Baltimore and that river.

The United States' Engineers estimate the cost of the proposed canal from Washington to Pittsburg to be $22,375,427; but we will suppose it could be made for one-half of this sum, or - -	$11,000,000
To which should be added the cost of constructing a continuous canal from the city of Baltimore to the eastern termination of the Chesapeake and Ohio Canal at Washington, that being the only point at which we can intersect it	1,000,000
	$12,000,000
The highest estimated cost of a rail road from Baltimore to the Ohio river, calculating the same to cost $20,000 per mile, (and this is believed to be a very high estimate,) would be	5,000,000
Amount of capital saved in favor of a rail road -	$7,000,000

Table No. 3.

Estimated difference of expense on transportation for tolls only, by the proposed canals from Baltimore through the District of Columbia to Pittsburg, and by a direct rail road route from Baltimore to some point on the Ohio river.

The United States' Engineers estimate the cost of transportation by the proposed Chesapeake and Ohio Canal, at the rate of 1½ cents for each ton per mile. Taking the whole distance, then, from Baltimore to Pittsburg,

as is shown in table No. 1, to be 390 miles, the tolls for conveying a ton of freight from Baltimore, the whole distance along this canal, would be $5 85

Tolls for carrying the same freight along the *proposed rail road* at the same rate per mile, *the distance being 250 miles*, would be - - - - - - - - $3 75

Amount of freight saved per ton. in favor of a rail road, at the same charge for tolls, would be - - - $2 10

TABLE No. 5.

Estimate of profits to the holders of Stock in the proposed Baltimore and Ohio Rail Road.

Expense of constructing the *proposed road*, being estimated at $20,000 per mile, and the distance being assumed to be 250 miles, would make the whole cost - - - $5,000,000

TABLE No. 6.

Estimated difference of the time it would take for conveying freight from Baltimore to Pittsburg, by the proposed Chesapeake and Ohio Canal, between those places, (through the District of Columbia,) and by a direct rail road from Baltimore to some point on the Ohio river.

The United States' Engineers estimate the time it will take to travel with loaded boats from Washington to Pittsburgh, to be - - - - - - 188 hours.

The distance between these points being 341 miles, we have only to add the same rate of travelling for the additional distance from Baltimore to Washington, say 48½ miles, and the additional time will be - - - 26½

Time employed in passing on the canal from Baltimore to Pittsburgh, - - - - - 214½

There is abundant evidence to prove from authentic documents published, that the rate of travelling upon rail roads, with the locomotive engines in England, (and this has been sufficiently shown to be the cheapest means,) is, with heavy loaded wagons, from 4 miles to 6 miles, and even 8 miles per hour; assuming, however, the slowest rate, and the passage will be made from Baltimore to the Ohio river, say 250 miles, at the rate of 4 miles per hour, is - 62½

Time saved in favor of the rail road each trip, 152 hours.

Table No. 7.

Synopsis of the six preceding tables.

Distance between Baltimore and Pittsburgh, by the proposed Chesapeake and Ohio Canal - - -	390	miles.
Distance from Baltimore to the Ohio river by the proposed rail road - - - - - -	250	
Distance saved by the road - - - -	140	miles.

Table No. 2.

Smallest estimated cost of the proposed Chesapeake and Ohio Canal - - - - - -	$12,000,000
Highest estimated cost of the contemplated rail road -	5,000,000
Amount of capital saved in favor of the road -	$7,000,000

Table No. 3.

Cost of transporting, for tolls only, on a ton of freight from Pittsburg to Baltimore, upon the Chesapeake & Ohio Canal	$5 85
Cost of same transportation by the proposed rail road	2 50
Tolls saved on each ton, by the rail road - - -	$3 35

Table No. 6.

Time employed in passing a boat from Baltimore to Pittsburg, by the Chesapeake and Ohio Canal - -	214½	hours.
Time to pass from Baltimore to the Ohio river, upon the proposed rail road - - - - - -	62½	
Time saved by the road each trip, - - -	152	hours.

Extract of an Act to incorporate the Baltimore and Ohio Rail Road Company. Passed December Session, 1826.

"Section 18. *And be it enacted,* That the said President and Directors, or a majority of them, shall have power to purchase, with the funds of said Company, and place on any rail road constructed by them under this act, all machines, wagons, vehicles, or carriages of any description whatsoever, which they may deem necessary or proper for the purposes of transportation upon said road, and that they shall have power to charge for tolls upon (and the transportation of persons) goods, produce, merchandise, or property of any kind whatsoever, transported by them along said rail way, from the city of Baltimore to the Ohio river, any sum not exceeding the following rates, viz: on all goods, produce, merchandise,

or property of any description whatsoever, transported by them from west to east, not exceeding one cent a ton per mile for toll, and three cents a ton per mile for transportation: on all goods, produce, merchandise, or property of any description whatsoever, transported by them from east to west, not exceeding three cents a ton per mile for tolls, and three cents a ton per mile for transportation: and for the transportation of passengers, not exceeding three cents per mile for each passenger. And it shall not be lawful for any other company, or any person or persons whatsoever, to travel upon or use any of the roads of said company, or to transport persons, merchandise, produce, or property of any description whatsoever, along said roads, or any of them, without the license or permission of the President and Directors of said company; and that the said road or roads, with all their works, improvements, and profits, and all the machinery of transportation used on said road, are hereby vested in said company incorporated by this act, and their successors forever; and the shares of the capital stock of said company shall be deemed and considered personal estate, and shall be exempt from the imposition of any tax or burthen by the States assenting to this law."

Extract of an act passed by the Legislature of Pennsylvania on the 9th of February, 1826, incorporating the Chesapeake and Ohio Canal Company.

"SECTION 3. *And be it further enacted by the authority aforesaid,* That, as a condition on which this act shall pass, no greater tolls shall be charged or paid on goods, commodities, and produce, entering and transported on the said Chesapeake and Ohio Canal, from such lateral canals, than are charged and paid on other goods, commodities, and produce, of the same kind, transported on the said Chesapeake and Ohio Canal: *And provided further,* That the aforesaid Chesapeake and Ohio Canal Company shall extend the Chesapeake and Ohio Canal to, and terminate the same at, the city of Pittsburg."

At a general meeting of the Stockholders of the Chesapeake and Ohio Canal Company, holden by adjournment, on Saturday, 21st of June, 1828, it was

Resolved, That, whenever the western section of the Chesapeake and Ohio Canal shall be constructed, the western termination thereof shall be at Pittsburg.

Extract of an act passed by the Legislature of Pennsylvania, on the 27th of February, 1828, "to authorise the Baltimore and Ohio Rail Road Company to construct a rail road through Pennsylvania, in a direction from Baltimore to the Ohio river."

"SEC. 9. *And be it further enacted by the authority aforesaid,* That, as a condition on which this act is granted, it shall be the duty of the said company, in case the rail road aforesaid, made in this Commonwealth in pursuance of this act, shall not terminate at the Ohio river, in the vicinity of Pittsburg, to construct a lateral rail road, simultaneously, on the same principles and plans of the main rail road, and which shall connect the city of Pittsburg with the main rail road."

Extracts of the Charter granted by the Commonwealth of Virginia to the Chesapeake and Ohio Canal Company, on the 27th January, 1824.

"SEC. 10. *And be it enacted,* That the President and Directors of the company hereby created shall have power, and it shall be their duty, to ordain and establish a rate of tolls to be paid upon boats, vessels, rafts, or other property, passing on the part of the canal so completed, and so, from time to time, as part or parts shall be completed, and until the eastern section thereof shall be finished up to the mouth of Savage river or creek; and, thereafter, until the entire canal shall have been finished, according to the true intent and meaning of this act. For the collection of which tolls, the President and Directors shall have power to establish so many toll houses, and, at their pleasure, to appoint and remove so many collectors, and at such places as, from time to time, they may judge expedient; and the said President and Directors shall have full authority, subject to the direction and control of a majority, in interest, of the stockholders represented in any general meeting, to regulate and fix a tariff of tolls, not exceeding an average of *two cents per ton* per mile; and so to adjust the said tolls, in relation to the capacity or burthen of the boats, and the dimensions of the rafts passing the locks of the said canal, as to promote economy of water and time in the navigation thereof."

"SEC. 14. *And be it enacted,* That the said canal, and the works to be erected thereon in virtue of this act, when completed, shall forever thereafter be esteemed and taken to be navigable as a public highway, free for the transportation of all goods, commodities, and produce whatever, on payment of the tolls to be imposed as provided by this act; and no other toll or tax whatever, for the use of the said canal and works thereon erected, shall, at any time hereafter, be imposed, but by consent of the said States, and of the United States."

Extract from the proceedings of the Chesapeake and Ohio Canal Convention, held at the city of Washington on the 6th of December, 1826.

Among others who appeared as Delegates to the said Convention, were the following gentlemen:

From Baltimore city—Present, Solomon Etting, Benjamin C. Howard, William Lorman, Isaac McKim, Jos. W. Patterson, and Philip E. Thomas.

The following gentlemen, also appointed Delegates to the Convention by the city of Baltimore, were absent: Thomas Ellicott, Roger B. Taney, Luke Tiernan.

The Central Committee having made their report, recommending the adoption of certain resolutions, and the first of the said resolutions being under consideration, to wit:

Resolved, That it will be expedient to obtain such an amendment of the charter of the Chesapeake and Ohio Canal Company as shall authorise the company to terminate, if they deem proper, the eastern section of the said canal at or near the town of Cumberland; and to extend, by any route therefrom, the western section of the said canal across the Alleghany to Pittsburg, or to substitute therefor a railway; and in the event that such a change shall be deemed expedient in the route now prescribed by the

charter, to defer the extension of a canal along the Potomac, from Cumberland to the mouth of Savage, and to reduce the dimensions thereof to a breadth less than that now required :

Mr. Kennedy moved to strike out the words "or to substitute therefor a railway."

Mr. Key moved to add, "or such other mode of transportation as they may find expedient."

Mr. Kennedy's motion was negatived.

The resolution was adopted, by adding to the resolution of the Central Committee, after the word "railway," "or turnpike road on that portion of the route, or any part thereof, designated in the report of the Board of Internal Improvement, of the 23d of October, 1826, as the middle section, or on that part of the route by Savage which corresponds therewith."

The second resolution recommended by the Central Committee, in the following words, was then taken up :

Resolved, That it will be expedient to address a memorial to the Congress of the United States, requesting a subscription to the stock of the said canal, and a like memorial to the Legislatures of Virginia, Maryland, and Pennsylvania ; and that an application be made to the cities of Washington, Georgetown, and Alexandria, to aid, by a similar subscription, the stock of the said company.

On motion of Mr. Etting, the word "Baltimore" was added, after the word "Alexandria," in the foregoing resolution.

The foregoing resolutions were, it is believed, adopted *unanimously* by the Convention.

Extract of the act of the Legislature of the State of Maryland, passed at December session, 1826, "*to amend the act incorporating the Chesapeake and Ohio Canal Company.*"

"SEC. 2. *And be it further enacted*, That the Chesapeake and Ohio Canal Company shall have power to terminate the eastern section of the said canal at or near the town of Cumberland, on the river Potomac, and thence to extend the western section thereof, in any direction that may be deemed expedient, by any other route, as well as that prescribed in the act aforesaid, towards Pittsburg, on the river Ohio ; and, in extending the same in any direction across the dividing ridge which separates the eastern and western waters, to substitute, for a tunnel and numerous locks on such part of the route, inclined planes or railways, or any other artificial communication, or roads ; and, in the event that the western section of the Chesapeake and Ohio Canal shall leave the valley of the Potomac river at any point below the coal banks at or near the mouth of Savage, on the north branch thereof, the company shall have the power, in like manner, to extend a branch from the main canal to the said coal banks, at or above the mouth of Savage, and to cause such branch to be constructed of such dimensions as their views of their own and the public interest may warrant ; and, for the construction of the same, shall have and enjoy the same rights, privileges, and immunities, under the same restraints and conditions, in all respects, as they are entitled to in relation to the main Chesapeake and Ohio Canal."

Extract of an act passed by the Legislature of Pennsylvania on the 9th February, 1826, "incorporating the Chesapeake and Ohio Canal Company."

"SEC. 4. *And be it further enacted by the authority aforesaid,* That the said Chesapeake and Ohio Canal Company shall have full power and authority to alter and change the route of the western section of the said canal so that the same may commence at the town of Cumberland, situated near the junction of Wills' creek with the north branch of the Potomac, and be continued from thence, by the valley of Wills' creek and Castleman's river, to the Youghiogeny; and, from thence, to the city of Pittsburg: Provided, That the United States' Board of Internal Improvement, or a majority thereof, should deem and report that route to be the best."

Extract of an act passed by the Legislature of Virginia on the 26th of February, 1827, "giving the assent of this State to an act to amend the act incorporating the Chesapeake and Ohio Canal Company, as passed by the State of Maryland."

Whereas it is represented that the General Assembly of the Commonwealth of Maryland hath passed, at their present session, an act, entitled "An act to amend the act incorporating the Chesapeake and Ohio Canal Company," in the words following, to wit:

"1. *Be it enacted by the General Assembly of Maryland,* That the act, entitled "An act incorporating the Chesapeake and Ohio Canal Company," passed by the General Assembly of Virginia at the December session, eighteen hundred and twenty-three, which has already received the assent of the State of Maryland, and of the Congress of the United States, as well as of the Potomac Company, shall be, and the same is hereby, amended, in the manner hereinafter provided, on condition that this act receive, in like manner, the assent of the necessary parties thereto.

"2. *And be it enacted,* That the Chesapeake and Ohio Canal Company shall have power to terminate the eastern section of the said canal at or near the town of Cumberland, on the river Potomac, and thence to extend the western section thereof, in any direction that may be deemed expedient, by any other route, as well as that prescribed in the act aforesaid, towards Pittsburg, on the river Ohio and in extending the same in any direction across the dividing ridge, which separates the eastern and western waters, to substitute for a tunnel and numerous locks, on such part of the route, inclined planes and railways, or any other artificial communication, or roads; and, in the event that the western section of the Chesapeake and Ohio canal shall leave the valley of the Potomac river at any point below the coal banks at or near the mouth of Savage, on the north branch thereof, the company shall have the power, in like manner, to extend a branch from the main canal to the said coal banks at or above the mouth of Savage, and to cause such branch to be constructed of such dimensions as their views of their own and the public interest may warrant; and for the construction of the same, shall have and enjoy the same rights, privileges, and immunities, under the same restraints and conditions, in all respects, as they are entitled to in relation to the main Chesapeake and Ohio Canal.

"3. *And be it enacted,* That nothing in this act contained shall be held to discharge the said company from a compliance with each and every of the conditions of the original act, except so far as the same are expressly altered by the provisions of this act.

"4. *And be it enacted,* That this act shall commence and be in force as soon as it shall have received the assent of the Legislature of Virginia, of the Congress of the United States, and of the Potomac Company."

SEC. 1. *Be it therefore enacted by the General Assembly of this Commonwealth,* That the assent of this Legislature in and to the amendment to "the act incorporating the Chesapeake and Ohio Canal," as contained in the foregoing act of the General Assembly of Maryland, is hereby as fully and completely given as if the said amendatory act had been passed by this present General Assembly."

Extract of an act of the Congress of the United States, approved on the 23d of May, 1828, "*to amend and explain an act, entitled 'An act confirming an act of the Legislature of Virginia incorporating the Chesapeake and Ohio Canal Company, and an act of the State of Maryland for the same purpose.'*"

SEC. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the assent already given by the United States to the charter of the Chesapeake and Ohio Canal Company, by an act of Congress, entitled "An act confirming an act of the Legislature of Virginia, entitled an act incorporating the Chesapeake and Ohio Canal Company, and an act of the State of Maryland confirming the same," shall not be impaired by any change of the route of the said canal from or above the town of Cumberland, on the river Potomac, or the distribution thereof into two or more sections, at any time hereafter, or any change in the dimensions of that part of the present eastern section extending from Cumberland, or the mouth of Will's creek, to the mouth of Savage, at the base of the Alleghany, or any substitution which the interest of the Chesapeake and Ohio Canal Company may, in the opinion of the company, require to be made, of inclined planes, railways, or an artificial road for a continued canal, through the Alleghany mountain, in any route which may be by the company finally adopted therefor, between the town of Cumberland and the river Ohio.

Extract from the minutes of the proceedings of the President and Directors of the Chesapeake and Ohio Canal Company, at their regular meeting, Saturday, the 21st of February, 1829.

PRESENT—Charles F. Mercer, President; Phineas Janney, Peter Lenox, Frederick May, and Walter Smith, Directors.

It was resolved unanimously, That this Board approve the memorial to the Congress of the United States just read, and that the President be requested to sign and present the same in behalf of the Board.

Test: JOHN P. INGLE,
Clerk Ches. & Ohio Canal Comp'y.

CHESAPEAKE AND OHIO CANAL COMPANY.

MEMORIAL

OF THE

CHESAPEAKE AND OHIO CANAL COMPANY.

January 12, 1829.—Referred to the Committee on Roads and Canals.

To the Senate and House of Representatives of the United States of America in Congress assembled:

The memorial of the Chesapeake and Ohio Canal Company, by the President and Directors thereof,

Most respectfully represents:

That the undersigned, as soon as they found it practicable, after the organization of the company, by the election of its officers, proceeded to engage the services of the most distinguished Civil Engineers they could obtain, to revise the location, and superintend the construction, of all that portion of the canal along the northern shore of the Potomac, between its eastern termination and the first mountain, through which the prior surveys of the United States' Board of Internal Improvement, and of Messrs. Geddes and Roberts, had conducted it. At that point, an injunction from the Baltimore and Ohio Rail Road Company arrested their progress, as it still continues to retard, beyond it, the extension of their contracts. A skilful Engineer is, however, at present engaged in revising the location of the canal, to the east of that point, made pursuant to former acts of Congress; so that your memorialists will be prepared to place under immediate contract the line of the canal as far west as Cumberland, as soon as that controversy shall be definitively settled, and as your memorialists are led confidently to expect, in the ensuing Spring or Summer.

By the annexed rules and regulations, adopted for the government of the corps of Engineers in the service of the company, and the accompanying tables, illustrative of the probable cost, by reference to the actual contracts for the construction of forty-eight miles of the canal, it will be made apparent to your honorable body, that it will be as easy, and more economical, even in its first cost, to complete the eastern section of the canal, in three years from its commencement, than in five, the time contemplated in the act of the last session of Congress, authorising a subscription, on behalf of the United States, to its stock.

Your memorialists are, therefore, induced to apply for such an alteration of the terms of that subscription, as shall enable them to place the whole of that section under contracts to be executed within the period of three years, the shortest time contemplated in the charter of the company. They beg leave to state, as an additional inducement to this change, that it will not affect the demands upon the Treasury for the current year,

since it is not proposed to call for as large a sum, within that year, as is authorised by the existing law; that being, with the unexpended fifth of the last year, two fifths, or more than a third of the whole sum subscribed, as above mentioned. It is of course not proposed to authorise any earlier or larger call on the United States, than will be actually proportioned to the demands upon other stockholders, for the quotas of their respective subscriptions. It is designed, in expediting the completion of the first or eartern, to hasten the commencement of the western section of the canal; and by thus reaching the coal banks of the Alleghany in the shortest possible time, to render the expended stock productive at the earliest practicable period.

Your memorialists avail themselves of this occasion for applying to your honorable body for your assent to certain alterations of the charter of the Chesapeake and Ohio Canal Company, which they have sought, by cotemporaneous applications to the Legislatures of the States of Pennsylvania, Virginia, and Maryland. For the character and objects of these, they beg leave to refer to the annexed memorial, recently presented to the last of those States, and to the subjoined copies of the acts of the Legislatures of those States, referred to in the last clauses of that memorial.

The undersigned beg leave to add, in farther explanation of the last purpose, common to these memorials, that the relaxation of the acts of the Legislature of Virginia, which superseded the necessity of any farther legislation on the part of that State, in relation to this purpose, has occurred since the cession of the City and County of Alexandria to the United States; and that they would fain hope it may accord with the wisdom of Congress, to enact uniform laws respecting the condition of slaves, on both sides of the river Potomac, within the District of Columbia.

Finally, the undersigned beg leave to suggest, that, in this second appeal to the attention of your honorable body, they have sought to keep separate and distinct, objects, independent in their characters, and which could not have been united, without injury to each other. What their former memorial asked, was for the immediate interests of the cities of Washington and Alexandria, as well as of the United States, and has been invited in fulfilment of a specific engagement; what they now solicit, is essential to the prosperity of the common enterprise entrusted to their supervision and control, under the charter of the Chesapeake and Ohio Canal Company, which they now seek to amend.

C. F. MERCER,
President of the Chesapeake and Ohio Canal Company.

W. SMITH,
AND'W STEWART,
PETER LENOX,
FRED'K MAY,
} *Directors.*

OFFICE OF THE CHESAPEAKE AND OHIO CANAL CO.,
Washington, January 7, 1829.

To the General Assembly of Maryland.

The memorial of the Chesapeake and Ohio Canal Company, by the undersigned President and Directors thereof,

RESPECTFULLY REPRESENTS:

That, on the twentieth day of June last, the undersigned were elected President and Directors of the Chesapeake and Ohio Canal Company, by a general meeting of the Stockholders of the Company, convened, pursuant to notice, in the City Hall at Washington, and immediately afterward proceeded to execute the trust reposed in them, under the charter of the Company; a copy of which, with the bye-laws of the Company, certain rules adopted by the President and Directors for their own government, and that of their corps of Engineers, and tabular statements of the contracts made for the construction of forty-eight miles of the Canal, are annexed to this memorial, together with an exposition of the condition of the company's funds down to the last return of the Treasurer.

Among the duties which the undersigned have performed, in the past year, has been included, that of fixing definitively the eastern termination of the Canal.

In the performance of this delicate and difficult trust, it was deemed essential to the permanent validity of any decision which the President and Directors might form, that the subject should be submitted to a general meeting of the Stockholders.

In preparing a question, on which to take their final judgment, the President and Directors were regardful of the liberal spirit which the State of Maryland had ever manifested towards the enterprise confided to their care; and adverting to her past policy in relation to the future extension of the Canal, sought earnestly, and they confidently believe successfully, to advance that policy. By the report of a civil Engineer, a highly respectable native citizen of her great commercial emporium, it had been affirmed, that, to enable the State of Maryland to extend the Chesapeake and Ohio Canal to Baltimore; it should be brought down to Georgetown at a level not less than twenty-five or thirty feet above the tide. It has, accordingly, been brought to the heart of Georgetown, at a level of thirty-seven feet above tide water; thereby saving, in its future extension on that high level, not only the purchase or condemnation of much valuable ground in Georgetown, but the heavy excavation in the rear of Washington, to which a lower elevation would have been exposed, while the expense incurred beyond the point from whence the Chesapeake and Ohio Canal descends towards its termination, is chiefly for locking down to the river, which must, otherwise, have been encountered at greater inconvenience, and much greater cost, immediately above Georgetown.

The basin, essential to any termination of the Canal, would no where have proved of such easy construction, as at the mouth of Rock Creek; and the sale of the mole or pier, designed to form it, enlarged to a breadth of eighty feet, will pay, very nearly, for the construction of the entire basin.

The President and Directors, and the Stockholders, did not, while they promoted the interest of the State of Maryland, in advancing the general interest, and securing the harmony of the Company, fail to examine carefully the extent of the power under which they acted; and while not

doubting their chartered authority so to terminate the canal, yet, for greater security, referred the validity of the act by which they did so to the judgment of the highest law officer of the United States, whose published opinion accompanies this expose of the present condition of the common enterprise of so many Governments and cities.

The undersigned trust that it will appear that the great enterprise committed to their care is proceeding as prosperously and speedily as existing circumstances will permit, and as the public had been led to expect from the prior calculations submitted to the General Assembly of Maryland, and to the other parties to the charter of the Company, by the Central Committee of the Chesapeake and Ohio Canal Convention.

The available funds of the Company now amount to above three millions six hundred thousand dollars, to which the President and Directors hope very shortly to be able to add a subscription by the Commonwealth of Virginia, calculated to swell this sum to more than four millions of dollars; an amount it is believed sufficient to complete the canal as far, at least, as Cumberland.

The dimensions of the canal have been extended to sixty feet at its surface, forty-two feet at its base, and a depth of six feet below its water line; thus affording a cross section of 306 feet. The locks under contract are twenty-seven in number, and one hundred feet in length, and fifteen in breadth, in the clear: they average a lift of eight feet, and are to be constructed of solid stonemasonry. Two stone aqueducts over the Monocacy and Seneca, besides more than eighty culverts, and twelve lock-keepers' houses, of the same material, have been contracted for, as part of the forty-eight miles of canal already let. This portion of the canal embraces also a capacious basin at its eastern termination, requiring an extensive embankment or mole across the mouth of Rock Creek.

The cost of the whole of this work will be seen by the accompanying tables, to be nine hundred and fifty-one thousand two hundred and thirty-six dollars: and when the remaining lockhouses, a few waste weirs, and the Seneca feeder and guard lock, shall be added, the whole cost, exclusive of Engineers and officers' salaries, and contingencies, will probably reach one million and fifty thousand dollars. The undersigned cannot speek with absolute confidence on this subject, for reasons very apparent.

In the estimate of the excavation of the first seventeen miles let above the Little Falls and below the mouth of Seneca, the contracts were for a canal of five feet depth only. Some allowance must be made for the addition of one foot to this depth, and for the occasional discovery, below the natural surface of the ground, of rock, where common earth alone had been expected. A provision has also been made for lining the inner slopes of the canal with stone, where it can be done at reasonable cost. All these expenses, together, may swell the cost of the first forty-eight miles of the canal to very near or quite eleven hundred thousand dollars, or $ 22,916 per mile, exclusive of any allowance for damages to the proprietors of lands through which the canal is conducted. Of this amount, the inner pavement is computed at near one thousand dollars a mile. It is designed to fit the canal for boats moving with more than ordinary velocity, by protecting its banks from washing. By the increased dimensions of the canal, combined with the last mentioned provision, the President and Directors have sought to give every facility to that intercourse between the Eastern and Western States, which it is one of the objects of this great national work to promote.

The cross section of the Chesapeake and Ohio Canal will be found, on comparison with that of the Erie Canal of New York, to exceed the latter by nearly one hundred and twenty-per cent. An excess, leading to an advantage, the undersigned are prepared to show, much exceeds in value, the amount of its actual cost, since the most satisfactory experiments have demonstrated, that a boat, adapted to the locks of both canals, can be impelled, on that of greater volume, at the same velocity, with a force one third less than that required on the smaller canal: or, in other words, that, by the enlargement of the cross section of the Chesapeake and Ohio Canal, beyond that of the Erie Canal, an advantage has been gained, for the former, much more than equivalent to the entire consumption of time, by a lockage of more than three thousand two hundred feet. And this would be true, were a minute, per foot, allowed for passing through a series of locks of that aggregate lift. But when it is reflected, that, by very recent improvements in the construction of locks, that time is reduced one half, at least, this advantage becomes of yet greater magnitude. It is demonstrable by the force of experiment, that, after completing the continued navigation, so long contemplated, from the City of Washington to Pittsburg, which will be afforded by a canal not differing, materially, in length, from that which connects Albany with Lake Erie, though very greatly in lockage, a given tonnage may be transported on the former at twenty per cent. less cost, for carriage merely, than on the latter, so as more than to atone for the difference of cost, and therefore of tolls, between the two canals, arising from the expensive tunnel and lockage of the broader and deeper canal.

To realize all the benefit to be derived from this consideration; from the superior dimensions, and inner pavement of the Chesapeake and Ohio Canal, is one of the objects of the present memorial, by which the undersigned seek to obtain an explicit recognition of the power of the Chesapeake and Ohio Canal Company, to substitute boats for bridges, where the latter might be required on the canal in consequence of the difficulty of conducting a pathway beneath it. By leaving the surface of the water unimpeded by any superstructure, not only steam power, but sails may be used to great advantage upon the Chesapeake and Ohio Canal, as they are used, in like manner, on the Canal of the Forth and Clyde, in Scotland. Where steam is not used, as in relation to boats of heavy burthen drawn by horses, the occasional sail, spread to a favoring wind, will enable the boatmen to refresh their horses by carrying them on board, so that when put to the draft again, they will travel with renewed vigor and increased speed.

But the time may not be remote, when steam may supersede, on such a canal, the use of any other moving power; and it is for the wisdom of an enlightened legislature to guard against any permanent obstruction to its easy application.

Another end is also designed to be promoted by the substitution—security and comfort to the traveller.

It is known that many lives have been lost on the canals of New York, by the erection of bridges across them. Such bridges must be very low, or the inclined plane or road, leading to or from them, so steep as to be alike laborious and dangerous to ascend. A low bridge necessarily occasions a low pitched boat with a single deck, and a roof which no passenger dare stand upon, without encountering continually occurring hazard from the

bridges, under which he is to pass. From such a boat, exposed to the direct action of the sun's rays, the current of air is excluded by the canal banks, while every noxious winged insect is attracted to it, by the stagnant atmosphere in its vicinity. A boat, on the contrary, unobstructed by bridges, may be lifted, by a second or third story, above the banks of the canal, so that the traveller will be regaled by currents of fresh air, and an unobstructed prospect of the country around him, and find ample accommodation for exercise by day, and quiet repose by night. All this, too, he will have added to increased velocity and perfect safety, especially if the steam-boat be used to tow the passage-boats. The undersigned are confident of obtaining a velocity of 150 miles a day, for the passage-boats of their canal, if no impediment be thrown in their way by bridges. They, therefore, ask to be relieved from any supposed necessity of constructing them; and, in lieu of them, to be allowed to establish ferries on public roads, and to enter into a reasonable composition with proprietors, where estates are divided by the canal line, to supply a boat for their use, when needed; or to purchase or acquire the slip of land cut off from any larger tract by the canal, and afterwards to hold, sell, let, or otherwise dispose of it, for the benefit of the company.

The undersigned are induced to believe, that this power may be advantageously extended, so far as to enable the President and Directors, with the consent of any proprietor, to buy, on reasonable terms, the entire estate where so divided, and afterwards to hold, let, or otherwise dispose of it, on such terms as to exclude the necessity of any pass-way over the canal.

Regarding the preceding as a single purpose, involving several means for its perfect attainment, without private injury, the undersigned beg leave to add, that, since the charter of the company was completed, they have conceived it expedient, and such has been the unanimous sentiment of the stockholders, to release the restraints imposed on the sale or letting of water power along the margin of the canal.

Having, in several places, to resort to the main river for water, they, therefore, ask of your honorable body permission to sell or let, for prescribed manufacturing uses, any surplus water, which they may conduct, by feeders into the canal for that purpose, as well as that which unavoidably gains admission, and the present charter allows them to let. It will be seen, that Pennsylvania has, with judicious foresight, conceded what is now asked of your honorable body, and which, if granted, will be used in the spirit of its concession, without injury to the navigation of the canal.

For similar reasons, to promote the public benefit, cheapen the cost, and enhance the profit of their work, they ask like permission to sell or let, on the heavy embankments, which they may find it necessary to form, for the moles or piers adjacent to their basins, upon or at the termination of their canal, sites for houses of any description.

C. F. MERCER,
President of the Chesapeake and Ohio Canal Company.

WILLIAM SMITH,
ANDREW STEWART,
PETER LENOX,
FREDERICK MAY,
Directors.

AN ACT OF THE STATE OF MARYLAND.

An act in favor of the President and Directors of the Potomac Company and the Commissioners of the Federal Buildings.—[*Passed Nov. session*, 1794.]

Whereas the President and Directors of the Potomac Company, and the Commissioners of the Federal Buildings, heretofore, by their petition to this General Assembly, set forth, that the labor of the Potomac Company is best performed by negro slaves; that it is highly expedient that the laborers should be frequently removed from one side of the river to the other, as the work cannot, with convenience, be effected by distinct sets of laborers for each side of the river, and that a great deal of labor will be necessary in the City of Washington; and the masters of slaves in each State, as well as the public, may reap considerable benefit from the privilege of taking them from either State; and that it is but just that the citizens of both States should share in the advantages, as they have united in liberality towards the said City; and have prayed that a law might be made, permitting negro slaves to be employed by the public on either side of the river Potomac, either in the works of the Potomac Company, or of the City of Washington; and it appearing to this General Assembly that the prayer of the said petition ought to be granted, in part: Therefore,

2. *Be it enacted by the General Assembly of Maryland*, That it shall be lawful for the said Potomac Company, and for the said Commissioners, to employ any male slaves of the State of Virginia in any part of the public works committed to their respective charge, and not otherwise, on either side of the river Potomac, and to remove them as often as may be necessary to and from either of the said States; and that the slaves so employed shall not acquire any right to freedom in consequence thereof: *Provided, always*, That every slave brought from Virginia to Maryland, by virtue of this act, shall be carried back to Virginia within twelve calendar months from the final completion of the public works, either of the said City of Washington, or of the said river Potomac, respectively, in which the said slaves shall be employed; and that every slave not carried back, as aforesaid, shall be entitled to freedom at the expiration of twelve months, as aforesaid.

3. *And be it enacted*, That an act, passed at November session, seventeen hundred and ninety-two, entitled "An act in favor of the President and Directors of the Potomac Company and the Commissioners of the Federal Buildings," shall be, and it is hereby, repealed.

GALES & SEATON,
Printers to House of Reps.

20th Congress, 2d Session. [Doc. No. 120.] Ho. of Reps.

CHESAPEAKE AND OHIO CANAL COMPANY.

MEMORIAL

OF

Stockholders, &c. in the Chesapeake and Ohio Canal Company.

February 12, 1829.—Referred to the Committee of the Whole House on the state of the Union on bill No. 370.

To the Congress of the United States:

The memorial of the subscribers, who are stockholders in the Chesapeake and Ohio Canal Company, or owners of landed property in the District of Columbia, through which the canal, as traced, is intended to pass,

Respectfully represents:

That they have perceived, with surprise and regret, in a bill now pending before the House of Representatives, numbered 370. and entitled "A bill to amend the charter of the Chesapeake and Ohio Canal Company, and for other purposes," a provision, in the 3d and 4th sections, whereby it is proposed to arm the Board of Directors of that company with the very extraordinary power of acquiring, by condemnation or purchase, lands to an unlimited extent, unnecessary as to the object contemplated by all in the creation of the company; injurious, as your memorialists believe, to its real interests; and certainly unjust, in the highest degree, to the proprietors of lands in the vicinity of the canal.

Your memorialists must presume that this power has been asked for by the Board of Directors; and if so, it has certainly been without the authority of the company. At the two general meetings, (and the only two held by the stockholders since the organization of the company,) the directors were authorized to petition Congress, and the other legislative bodies, parties to the charter, among other matters, for some amendments to the charter; but no such power as this was contemplated or discussed at either meeting, and much less was it delegated to the directors to seek for the obtaining it. On the contrary, the only authorization in relation to water-rights was given to the Board of Directors at the general meeting held on the 17th September, 1828, and expressly confines it to "requesting such a modification of the charter of the company as to remove any doubt of the power of the company to apply to manufacturing purposes, by selling or letting water-rights, such part of the surplus water as may be deemed by the President and Directors expedient for the company," without a word about acquiring lands. By the charter, the company is expressly restricted from disposing of any water from the canal, for the

supply of works and machinery, except the waste-water, "where wastes shall be essential to the security of the said canal." (See 16th section of the acts of Virginia of 1824.) And this was deemed a necessary restriction at the time, as well by those who solicited the charter as by those who granted it, intended to confine the company strictly to the main object in view; that is, to the use of the water introduced into the canal for the purpose of navigation only; and thus to prevent, on the one hand, any encroachment on private rights, more than indispensable for the high way on the canal, and on the other, to avoid the mischiefs that might accrue by producing currents in it; and from collisions likely to arise between the interests of those claiming, under water-rights sold and those navigating the canal, as to the quantity of water to be drawn off for the one purpose, or retained for the other. The company, however, at the general meeting held in September last, did venture (as by the instruction to its directors herein before quoted) to seek to obtain the power to sell or let, all along the margin of the canal, such surplus water as the Board of Directors might deem expedient to permit to be applied to manufacturing purposes; but they went no further. They did not venture to ask to take land from the possession of individuals, by the high handed power of condemnation, or even by purchase, but for the plain and avowed purpose of producing an artificial navigation for the good of the whole community.

The power now asked of your honorable body, your memorialists beg leave to show, is of a very different character. It goes to make the company landholders to an indefinite amount, throughout the country, upon speculation, with funds designed, by those who contributed them, for a very different purpose, and whose consent should have been obtained before it was asked; because it may, and most probably will, divert from the true object of their destination toward imaginary profits, that may never be realised, such portion of the funds of the company, as to jeopardise the completion of that work which was singly in the view of the stockholders, when they respectively subscribed their money to the terms of the charter as it then stood.

But the power contemplated by the bill is, in another point of view, greatly more dangerous, and is, as your memorialists believe, unprecedented in our country. It wantonly invades the sacred right of private property.

It is a maxim of law, handed down to us by our ancestors, and cherished by every freeman in this community, that private property shall remain undisturbed in the hands of its possessor, except in cases where the interference may be required by the most urgent and palpable public good; and the public necessity must be manifest and imperious, before the hand of the law can be raised to dispossess an individual of property acquired by his own industry; or that of his forefathers. And it is a doctrine required by the safety of the people, and long practised, that corporations be limited, in the quantum of landed property, to the absolute and indispensable requirements of the direct object for which they may have been created.

Is this such a case? Far from it: it is that, upon a speculative and remote calculation of an addition to the company's funds, at the expense of individuals, the company is to be empowered to take, to hold, to improve, and to sell out lands to great, and, in some instances, to an unlimited extent. By the 3d section of the bill, it may, by condemnation, (one of the

means pointed out by the act of Virginia therein referred to,) wrest from the hands of individuals all the land lying between the line of the canal and Potomac river, to be *sold* or *let* by it as sites for manufacturing or *other purposes*. And by the 4th section, it may, by like process of condemnation, divest the proprietors of their lands to any amount, and however situated, which it may think proper to *need*, under the special pretext of giving strength to basins or moles; which land, so obtained, it is to be at full liberty afterwards to let for wharves or other buildings, (as warehouses, &c.,) or to retain and improve at its pleasure. And again: by the same section it may, *whenever* it shall be deemed to the interest of the company so to do, purchase and hold for ever, or sell or let, any tract of land, of any size, (of ten thousand acres, if such a case occurs,) through which it may happen that the canal is conducted. By the 5th section, a power alike unthought of and unauthorized by the stockholders, and equally oppressive to the community, is to be given to the company, which goes, by the intervention of condemnation, to debar proprietors the right of access across the canal from one portion of his estate to another, where it may have been divided by the canal.

Such are the provisions by which it is sought, unnecessarily and wantonly, to invade private rights, and to complicate and to jeopardise the interests of the company, by the acquirement and management of large landed interests, wholly foreign to its original design, and that have no direct relation to the object for which the privileges already enjoyed by it, under its charter, were granted.

Your memorialists humbly conceive that there can be no sound or legitimate motive for granting any such powers: and they respectfully and earnestly pray, that, as well in consideration of the true interests of the company, as in tender regard to the rights of individuals, the 3d and 4th and 5th sections of the before mentioned bill may be stricken out, or so modified that their provisions may be restricted to the right of disposing of water rights only on the margin of the canal, in such manner as provided by the act of the State of Pennsylvania, (of February, 1826,) for incorporating the same company; and, as to bridges and ferries, in such manner as is provided by the said act of Pennsylvania for bridges and fords.

Your memorialists cannot, however, dismiss the subject of the charter of the Chesapeake and Ohio Canal Company, in justice to their opinions, and, as they believe, to the interests of the stockholders at large, without some further remarks; inasmuch as the construction of an important part of that instrument has been brought to the consideration of Congress, by the memorial of the President and Directors of that Company, presented during the last month, (see Document, No. 12, of the House of Representatives,) in which it is assumed that the eastern termination of the canal, within the District of Columbia, has been definitively fixed at the mouth of Rock Creek, a position about two miles below tide water, available for such boats as will navigate the canal.

Your memorialists must deny that this termination has been so *finally* fixed: first, because it has been, as yet, only fixed by a decision of the stockholders, which may be changed or altered at the pleasure of any subsequent meeting, and especially as at the meeting at which it was fixed, but little stock was represented, except that subscribed on the part of the United States, and of the Corporations of this District, and of which, it is well known, the vote was entirely controlled by two persons only: those

who represented the stock of the United States, and that of the City of Washington; and, next, because the subject is yet open to judicial decision, on the question whether the Company has exceeded the power granted by the charter in attempting to extend the canal along the margin of tide-water for several miles; unless, indeed, the legislatures, parties to the charter, should change the present attitude of the law by indirect acts, such as would strengthen the construction given in this measure by the company.

Your memorialists will not now detain your Honorable Body by detailing the reasons which have rivetted on their minds a firm conviction that, under the charter, as it now stands, the company have *no power* to continue the canal to any distance, however small, on tide water, between such point as that from which the canal boats may be safely let down into it: and that, if the company had the power, it would be inexpedient, and a waste of the funds of the company to do so.

Should an opportunity, however, be afforded them, they are prepared to support this opinion by showing, from various documents, the intentions on this point, as well of the party soliciting the charter as that which granted it. For the present, they will confine themselves merely to referring your Honorable Body to the proceedings of the canal convention, held in Washington, in November, 1823; to the memorials presented by its committees to the Legislatures of Virginia and Maryland, during the Winter following, and to Congress in April, 1826: to the language of the charter itself, and to the construction given it by Congress, as shown in the act of 24th May, 1828, authorizing the subscription on the part of the United States; which documents, among many others that could be produced, will evince, as your memorialists believe, that it never was intended or expected that an expenditure of several hundred thousand dollars would be made in digging a canal, making basins, erecting moles, constructing bridges, &c., where nature has furnished a river free from obstructions, and navigable not only for canal craft, but for sea vessels; and this, too, in diminution of a fund yet far short of the sum necessary to carry the canal to the point contemplated on the upper part of the river, the attainment of which is indispensable to its success.

J. MASON,
F. S. KEY,
JAMES S. MORSELL,
JOHN LAIRD,
G. B. MAGRUDER,
JOHN GOSZLER,
JOHN LITLE,
WM. G. RIDGELY,
C. W. GOLDSBOROUGH.

GALES & SEATON,
Printers to House of Reps.

20th Congress, 2d Session. [Doc. No. 122.] Ho. of Reps.

FINANCES—CHESAPEAKE AND OHIO CANAL COMPANY.

LETTER

FROM

THE PRESIDENT OF THE CHESAPEAKE AND OHIO CANAL COMPANY,

TRANSMITTING

Information upon the subject of the Finances of said Company, and its Receipts and Disbursements.

February 13, 1829.—Read, and committed to the Committee of the Whole House to which is committed the Bill [No. 370] to amend the Charter of the Chesapeake and Ohio Company, and for other purposes.

Washington, *Febuary* 12, 1829.

Sir: In behalf of the President and Directors of the Chesapeake and Ohio Canal Company, I beg leave, through you, to submit to the House of Representatives the enclosed report of the present state of the finances of that Company, and of its receipts and disbursements down to the last report of the Treasurer of the company.

I have the honor to be,
With great respect,
Your obedient servant,
C. F. MERCER,
Pres. of the Ches. and Ohio Can. Co.

To the Speaker *of the House of Representatives.*

Office of the Chesapeake and Ohio Canal Company,

City Hall, Washington, D. C. February, 10, 1829.

To the Congress *of the United States:*

The undersigned, President of the Chesapeake and Ohio Canal Company, in behalf thereof, and in conformity with an order of the Board of Directors of the company, begs leave to

REPORT:

That the progress made by the company, in constructing the Chesapeake and Ohio Canal, will be found in the tables already presented to your Honorable Body, giving a minute statement of all the contracts now in a train of execution on the first forty-eight miles of the canal: that its further progress has been arrested by an injunction sued out of the Chancery Court of Maryland, at the instance of the Baltimore and

Ohio Rail Road Company; but that this company confidently expect a termination of that controversy by the ensuing midsummer. After which, the works on the canal, for the further prosecution of which due preparation will have been made, will be extended with the greatest possible despatch up the river Potomac, along the one or the other shore thereof, according to the issue of that controversy.

The undersigned has hereto annexed an abstract of the accounts of the company down to the 20th ultimo. More fully to explain the same, he begs leave to add that a large portion of the stock of the Potomac Company and some portion of the debts due by that company at the period of the surrender of its charter, have been subscribed to the stock of the Chesapeake and Ohio Canal Company.

As this portion of the stock of the new company will not be productive of any income to its holders until the stock paid for in current money of the United States shall have netted ten per cent. per annum to the proprietors, the amount of the former is not embraced in the accompanying abstract. It is expected ultimately to comprehend all the stock of the Potomac Company, in amount exceeding three hundred and ten thousand dollars, and nearly, or quite, all the debts which were due by the company, amounting to the further sum of one hundred and seventy-five thousand dollars

The stock, payable in money, will be seen to exceed three millions six hundred thousand dollars, and is expected, with the subscription anticipated from the Commonwealth of Virginia, to enable the Company to place the eastern section of the canal under contract during the present year, and to prepare for the commencement of the western section at no distant date.

This expedient arrangement will, however, depend, for its success, on the decision of your Honorable Body upon the prayer of that memorial which the President and Directors of the Chesapeake and Ohio Canal Company have recently had the honor to recommend to your favorable regard.

C. F. MERCER,
Pres. of the Ches. and Ohio Can. Co.

GALES & SEATON,
Printers to House of Reps.

1829.			
Jan. 20.	Amount of instalments upon subscriptions to the capital stock of the Chesapeake and Ohio Canal Company, which have been called for and received to this date, inclusive		$338,711 50
	Amount received from the Treasurer of the late Potomac Company for unclaimed dividends due sundry stockholders of said Company		366 30
	Amount received for tolls, Potomac Company		1,769 62
	Amount received from sundries charged to suspense account		180 00
	Capital stock payable in money, being exclusive of the Potomac stock:		
	36,063 shares of $100 each, is	$3,606,300 00	
	Amount of instalments called for to the 3d of March, 1829, of which two are not yet due, to wit: the 6th and 7th, payable in February and March, 1829	540,945 00	
	338,711 50 paid in on account of instalments due.		
	180,315 00 amount of 6th & 7th instalments, not due.		
	21,918 50 due for returns not received, and for delinquencies. The greater part of the apparent delinquencies arose from the absence of returns from the distant receivers and remote stockholders.		
	$540,945 00	$540,945 00	$341,027 42

1829.			
Jan. 20.	By amount of expenses of Commissioners		$232 05
	By amount in the hands of Commissioners not remitted		19 00
	By amount of contingent expenses		1,328 45
	By amount of requisitions upon the Treasurer which have been presented and paid		32,642 33
	By balance in the hands of Commissioners for superintending subscriptions to their credit in the office of the Bank of the United States, Washington	$1,431 04	
	By balance to the credit of the Chesapeake and Ohio Canal Company in the—		
	Office Bank of U. S., Washington	172,914 81	
	Bank of Washington	2,584 01	
	Patriotic Bank	11,983 50	
	Bank of Alexandria	6,156 91	
	Bank of Potomac	13,333 00	
	Farmers' Bank of Alexandria	4,500 00	
	Mechanics' Bank of Alexandria	3,100 00	
	Farmers and Mechanics' Bank, Georgetown	35,418 35	
	Farmers & Mechanics', Con. Fund	1,671 55	
	Farmers & Mechanics', unclaimed dividends Potomac Company	366 30	
	Farmers & Mechanics', tolls Potomac Company	1,769 62	
	Office of the Bank of the Valley, Charlestown, Va.	773 50	
	Hagerstown Bank	803 00	
	In 5 per cent. stock of the State of Maryland	50,000 00	
			306 805 59
			$341,027 42

Office of the Treasurer of the Chesapeake and Ohio Canal Company, January 20, 1829.

C. SMITH, *Treasurer.*

[Doc. No. 122.]

MEMORIAL

OF THE

PRESIDENT AND DIRECTORS

OF THE

CHESAPEAKE AND OHIO CANAL COMPANY,

RELATIVE TO

Differences between that Company and the Baltimore and Ohio Railroad Company, as to precedence, in the selection and location of the route, at certain points.

FEBRUARY 26, 1829.—Referred to the Committee on Roads and Canals, and ordered to be printed.

To the Senate and House of Representatives, of the United States of America, in Congress assembled.

The memorial of the President and Directors of the Chesapeake and Ohio Canal Company,

MOST RESPECTFULLY REPRESENTS:

That they have heard with great concern, that the enterprise confided to their care by the stockholders of the Company, among whom they have the honor to comprehend the United States, has been represented to be, in part, at least, impracticable.

Your memorialists have been informed, and believe, that those representations refer to the portion of their undertaking which is expected to connect the Potomac, at or above Cumberland, with the navigable waters of the west, at Pittsburg; and they are apprised of the assertion, that there will not be water to supply that part of the canal, and that the expense of its application, by a tunnel through the Alleghany, has been exaggerated, and represented to be the only means of accomplishing the great end which they are empowered to pursue.

In reply to these objections, your memorialists beg leave to refer to the message of the President of the United States, of the 7th of December, 1826, to both Houses of Congress, transmitting the report of the United States' Board of Internal Improvement, concerning the practicability, the plan, and the route of the Chesapeake and Ohio Canal; to which your memorialists now add the accompanying letter from the chief of that Board.

Whilst they totally disclaim any unfriendly feeling towards the public-spirited enterprise of the Baltimore and Ohio Railroad Company, and

equally disavow any pretension, on their part, to intercept the bounty of Congress, towards any object whatever—they cannot permit their silence, under existing circumstances, to imply an abandonment, on their part, of the rights of the Chesapeake and Ohio Canal Company; and they beg leave to ask of you, therefore, an examination of the second section of the act of the State of Maryland, passed at the December session of 1826, of her General Assembly, entitled, "An act to amend the 'Act incorporating the Chesapeake and Ohio Canal Company;'" which having been passed, in conformity with the fourth section of an act of the Legislature of Pennsylvania, of the 9th of February, 1826, entitled "An act incorporating the Chesapeake and Ohio Canal Company," and having been subsequently confirmed, by correspondent acts of the General Assembly of Virginia, and of the Congress of the United States, bearing date, respectively, the 26th of February, 1827, and 23d of May, 1828, of all which acts, complete copies or extracts therefrom are hereto annexed, because part of the charter of the Chesapeake and Ohio Canal Company, and granted to them, authority "to terminate the eastern section of the said canal at or near the town of Cumberland, on the river Potomac, and to extend the western section thereof in any direction that may be deemed expedient, by any other route, as well as that prescribed in the act aforesaid, (being an act incorporating the Chesapeake and Ohio Canal Company,) towards Pittsburg; and in extending the same in any direction across the dividing ridge which separates the eastern and western waters, to substitute for a tunnel and numerous locks, on such part of the route, inclined planes and railways, *or any other artificial communication*, or roads."

It is evident, therefore, from the terms of this authority, and especially those of the prior act of Pennsylvania, that the Chesapeake and Ohio Canal Company have full power, where an adequate supply of water to feed a canal between Cumberland and the navigable waters of the west may not exist, to construct a railway; and, consequently, a part of the very railway which the Congress of the United States are invited to aid in constructing, with the funds of the nation, for the benefit of another company.

If aid for this object has not been solicited of your honorable body, under the authority of the Chesapeake and Ohio Canal Company, by your memorialists, it has been because, as yet, they have not been able to decide, definitively, on the expediency of constructing a continued canal, or a railway, on the "middle section" (to use a denomination of the United States' Engineers,) of the Chesapeake and Ohio Canal; and because they have been desirous to furnish, by the actual construction of part of the eastern section of the canal, conclusive evidence that the whole can be made on an enlarged plan, for a sum much less than that at which its cost was estimated, prior to the subscription to its stock by Congress, of one million of dollars. By the next winter this evidence will have been supplied, through the operation of the contracts already formed, for the completion of forty-eight miles of the canal, being all that part of the eastern section which has been left open to execution, by the unexpected interference of the Baltimore and Ohio Rail Road Company, with the route laid down by the United States' Board of Internal Improvement, for that section, and approved by an examination, by order of the general government, of the same route, by two eminent Civil Engineers of New York, Messrs. James Geddes, and Nathan S. Roberts.

Your memorialists are aware that other routes may be designated for a railway from Cumberland to the river Ohio, at Pittsburg, besides that which

may be chosen, after a thorough examination of the intermediate ground, by the Chesapeake and Ohio Canal Company; but your memorialists are not allowed, by any reference to experience, to confide in the probable selection, by the Baltimore and Ohio Railroad Company, of a route, for their road, which shall not interfere with the rights of this company, which are "to extend a branch canal up the Potomac, from Cumberland, to the coal banks on that river, and to make a railway or canal from Cumberland towards Pittsburg, on any route they may please to select." It is from a sense of duty, and a sense of duty only, that your memorialists are obliged to say, that no interference, by that company, with either of those rights, could be more injurious than the steps which they have already taken, to arrest the progress of the Chesapeake and Ohio Canal, on its twice designated route along the valley of the Potomac river.

Your memorialists did not interfere, in their individual capacity, when it was publicly announced that certain public-spirited individuals in Maryland sought a charter of the States of Maryland and Virginia, to construct a railway from Baltimore to the Ohio, because no interference with the charter already obtained, by much and long-continued labor, on the part of the "Chesapeake and Ohio Canal Convention," was apprehended. The gentlemen who asked a charter for a railway, disapproving of the circuitous route of the canal, directed the public attention to a wholly distinct path for their enterprize. While their contemplated railway preserved this character, the members of the Chesapeake and Ohio Canal Convention, and the Central Committee of that Convention, specially charged to watch over its interests, not only did not interfere with the wishes of the friends of the railway, but, as is known to your memorialists, favored their application for a charter, both in Maryland and Virginia.

The accompanying extracts, from the pamphlet first announcing the intended application for this charter, illustrate and confirm the truth of this statement, and have an important bearing on the apprehensions of your memorialists.

If reference be had to the interest of the United States, in the stock of the Chesapeake and Ohio Canal Company, and to the annexed terms of the charters of both companies, no reason will be found, in their relative privileges, to prefer the claims of that which now seeks the aid of Congress.

The Congress of the United States, having already authorized an investiture of one million of dollars in the Chesapeake and Ohio Canal, it is an act of duty, on the part of your memorialists, to the United States, as well as to the other holders of stock in the Chesapeake and Ohio Canal Company, however reluctantly performed, in consequence of the desire of the memorialists to preserve that harmony which they have hitherto maintained between all the legitimate objects of internal improvement, and that confided to their care, to ask of the Congress of the United States, not to express, in any mode, an opinion upon the relative legal pretensions of the two companies.

By order, and in behalf of the Board.

C. F. MERCER,

President of the Chesapeake and Ohio Canal Company.

The President and Directors of the Chesapeake and Ohio Canal Company in meeting, February 21st, 1829 —

PRESENT:

CHARLES F. MERCER, *President.*

PHINEAS JANNEY,
PETER LENOX,
FREDERICK MAY, and
WALTER SMITH, } *Directors.*

Resolved, unanimously, That the memorial to the Congress of the United States, this day adopted, be signed and presented by the President, in behalf of this Board.

JOHN P. INGLE,
Clerk Ches. and Ohio Canal Co.

Extracts from the Report of the Committee, made and included in the "Proceedings of sundry citizens of Baltimore, convened for the purpose of devising the most effectual means of improving the intercourse between that city and the Western States."—Report made in February, 1827; pages 30 and 31.

In conclusion, the Committee beg leave to refer to the annexed tables, numbered from 1 to 7, in which they have arranged, under a condensed form, some of the more important facts and statements embraced in this report. The Committee have also, in these tables, contrasted the advantages which, in their opinion, would be likely to accrue to the city of Baltimore, from connecting her trade with the Western States, by intersecting the contemplated Chesapeake and Ohio Canal, within the District of Columbia, and by *a direct railroad from Baltimore to some eligible point on the Ohio river.*

Names of the gentlemen composing the Committee who made this report:

PHILIP E. THOMAS,
BENJ. C. HOWARD,
GEORGE BROWN,
TALBOT JONES,
JOSEPH W. PATTERSON,
EVAN THOMAS, and
JOHN V. L. McMAHON.

After the report of the Committee had been read and approved, it was, among other things,

Resolved, That a Committee, consisting of twenty-five members, be appointed by the chairman of this meeting, whose duty it shall be to prefer an application to the Legislature of Maryland for an act of incorporation.

The following Committee was then appointed to carry into effect the object of the meeting, to wit:

CHARLES CARROLL, *of Carrollton*,
WILLIAM PATTERSON,
ISAAC M'KIM,
ROBERT OLIVER,
CHARLES RIDGLEY, *of Hampton*,
THOMAS TENANT,
ALEXANDER BROWN,
JOHN M'KIM, Jun.,
TALBOT JONES,
JAMES WILSON,
THOMAS ELLICOTT,
GEORGE HOFFMAN,
PHILIP E. THOMAS,
WILLIAM STEUART,
WILLIAM LORMAN,
GEORGE WARNER,
BENJ. C. HOWARD,
SOLOMON ETTING,
W. W. TAYLOR,
ALEXANDER FRIDGE,
JAMES L. HAWKINS,
JOHN B. MORRIS,
LUKE TIERNAN,
ALEXANDER M'DONALD, and
SOLOMON BIRKHEAD.

The following gentlemen compose the Board of President and Directors of the Baltimore and Ohio Rail Road Company:

PHILIP E. THOMAS, *President*,
CHARLES CARROLL, *of Carrollton*,
WILLIAM PATTERSON,
ROBERT OLIVER,
ALEXANDER BROWN,
GEORGE HOFFMAN,
ALEXANDER FRIDGE,
WILLIAM LORMAN,
JOHN B. MORRIS,
ISAAC M'KIM,
PATRICK MACAULAY,
WILLIAM STEUART,
SOLOMON ETTING,
TALBOT JONES.

Appendix to the preceding Report.

TABLE No. 1.

Estimated difference in the distance between connecting the city of Baltimore with the western trade, by a continuous canal, intersecting the eastern termination of the proposed Chesapeake and Ohio Canal, within the District of Columbia, and of connecting Baltimore with this trade by a rail-way, direct from that city to some suitable point on the Ohio river.

	Miles.
The United States' Engineers report the length of the Chesapeake and Ohio Canal, from the City of Washington to Pittsburg, on the Ohio river, to be - - - -	341½
Estimated length of a canal from Baltimore, to intersect the Chesapeake and Ohio Canal at Washington, - -	48½
Whole distance of a canal, by this route, from Baltimore to Pittsburg, - - - - - - -	390
Estimated distance of a railroad from the city of Baltimore to Wheeling, or some other suitable point, on the Ohio river, - - - - - - -	250
Distance saved by a railroad, - - - - -	140

TABLE No. 2.

Comparative cost of constructing a canal communication, between the city of Baltimore and the Ohio river, by the proposed route of the Chesapeake and Ohio Canal, and by the proposed direct rail-road communication between Baltimore and that river.

The United States' Engineers estimate the cost of the proposed canal from Washington to Pittsburg, to be $22,375,427 00; but we will suppose it could be made for one half of this sum, or, - - - - -	$ 11,000,000 00
To which should be added, the cost of constructing a continuous canal from the city of Baltimore to the eastern termination of the Chesapeake and Ohio Canal, at Washington, that being the only point at which we can intersect it, - - - - - -	1,000,000 00
	$ 12,000,000 00
The highest estimated cost of a rail-road from Baltimore to the Ohio river, calculating the same to cost $ 20,000 per mile, (and this is believed to be a very high estimate,) would be - - - - -	5,000,000 00
Amount of capital saved in favor of the rail-road, -	$ 7,000,000 00

TABLE No. 3.

Estimated difference of expense on transportation, for tolls only, by the proposed canals from Baltimore, through the District of Columbia, to Pittsburg, and by *a direct railroad route from Baltimore* to some point on the Ohio river.

The United States' engineers estimate the cost of transportation, by the proposed Chesapeake and Ohio Canal, at the rate of one cent and a half, for each ton, per mile. Taking the whole distance then from Baltimore to Pittsburg, as is shown in Table No. 1, to be 390 miles, the tolls for conveying a ton of freight from Baltimore the whole distance along this canal, would be -	$ 5 85
Tolls for carrying the same freight along the proposed rail road, at the same rate per mile, the distance being 250 miles, would be - - - - - - -	3 75
Amount of freight saved per ton, in favor of a railroad, at the same charge for tolls, would be - -	$ 2 10

TABLE No. 5.

Estimate of profits to the holders of stock in the proposed Baltimore and Ohio Railroad.

Expense of constructing the proposed road being estimated at $20,000 per mile, and the distance being assumed to be 250 miles, would make the whole cost -	$5,000,000 00

TABLE No. 6.

Estimated difference of the time it would take for conveying freight from Baltimore to Pittsburg, by the proposed Chesapeake and Ohio Canal, between those places, through the District of Columbia, and by a direct railroad from Baltimore to some point on the Ohio river.

	Hours.
The United States' engineers estimate the time it will take to travel with loaded boats from Washington to Pittsburg, to be - - - - - - -	188
The distance between these points being 341 miles, we have only to add the same rate of travelling for the additional distance from Baltimore to Washington, say 48½ miles, and the additional time will be - - -	26½
Time employed in passing on the proposed canals from Baltimore to Pittsburg, - - - -	214½
There is abundant evidence to prove, from authentic documents published, that the rate of travelling upon rail roads, with the locomotive engines, in England, (and this has been sufficiently shown to be the cheapest means,) is, with heavy loaded wagons, from four to six miles, and even eight miles per hour. Assuming, however, the slowest rate, and the passage will be made from Baltimore to the Ohio river, say 250 miles, at the rate of four miles per hour, is - - - - - - - -	62½
Time saved in favor of the railroad, each trip, -	152

TABLE No. 7.

Synopsis of the six preceding Tables.

Table 1.

	Miles.
Distance between Baltimore and Pittsburg, by the proposed Chesapeake and Ohio Canal, - - -	390
Distance from Baltimore to the Ohio river, by the proposed railroad, - - - - - -	250
Distance saved by the road, - - - -	140

TABLE 8.

Smallest estimated cost of the proposed Chesapeake and Ohio Canal,	$12,000,000 00
Highest estimated cost of the contemplated railroad,	5,000,000 00
	$ 7,000,000 00

TABLE 3.

Cost of transporting, for tolls only, on a ton of freight, from Pittsburg to Baltimore, upon the Chesapeake and Ohio Canal,	$ 5 85
Cost of same transportation by the proposed railroad,	2 50
Tolls saved on each ton by the rail-road,	$ 3 35

TABLE 6.

	Hours.
Time employed in passing a boat from Baltimore to Pittsburg, by the Chesapeake and Ohio Canal,	214½
Time to pass from Baltimore to the Ohio river, upon the proposed railroad,	62½
	152

Extract of an Act to incorporate the Baltimore and Ohio Railroad Company.—Passed December session, 1826, by the Legislature of Maryland.

"SEC. 18. *And be it enacted*, That the said President and Directors, or a majority of them, shall have power to purchase, with the funds of said company, and place on any rail road constructed by them, under this act, all machines, wagons, vehicles, or carriages, of any description whatsoever, which they may deem necessary, or proper, for the purpose of transportation upon said road: and that they shall have power to charge for tolls upon (and the transportations of persons,) goods, produce, merchandise, or property of any kind whatsoever, transported by them along said railway, from the city of Baltimore to the Ohio river, any sum not exceeding the following rates: viz. On all goods, produce, merchandise, or property of any description whatsoever, transported by them from west to east, not exceeding one cent a ton, per mile, for toll, and three cents a ton, per mile, for transportation: On all goods, produce, merchandise, or property of any description whatsoever, transported by them from east to west, not exceeding three cents a ton, per mile, for tolls, and three cents a ton, per mile, for transportation; and for the transportation of passengers, not exceeding three cents per mile for each passenger. And it shall not be lawful for any other company, or any person or persons whatsoever, to travel upon, or use any of the roads of said company, or to transport persons, merchandise, produce,

or property, of any description whatsoever, along said roads, or any of them, without the license or permission of the President and Directors of said company; and that the said road or roads, with all their works, improvements, and profits, and all the machinery of transportation used on said road, are hereby vested in said company, incorporated by this act, and their successors forever; and the shares of the capital stock of said company shall be deemed and considered personal estate, and shall be exempt from the imposition of any tax or burthen by the States assenting to this law."

Extract of an act, passed by the Legislature of Pennsylvania, on the 9th of February, 1826, incorporating the Chesapeake and Ohio Canal Company.

"SEC. 3. *And be it further enacted, by the authority aforesaid*, That, as a condition on which this act shall pass, no greater tolls shall be charged or paid on goods, commodities, and produce, entering and transported on the said Chesapeake and Ohio Canal, from such lateral canals, than are charged and paid on other goods, commodities, and produce, of the same kind, transported on the said Chesapeake and Ohio Canal: *And provided further*, That the aforesaid Chesapeake and Ohio Canal Company shall extend the Chesapeake and Ohio Canal to, and terminate the same at, the city of Pittsburg."

At a general meeting of the Stockholders of the Chesapeake and Ohio Canal Company, holden by adjournment, on Saturday, the 21st of June, 1828, it was

"*Resolved*, That, whenever the western section of the Chesapeake and Ohio Canal shall be constructed, the western termination thereof shall be at Pittsburg."

Extract of an act, passed by the Legislature of Pennsylvania, on the 27th of February, 1828, "to authorize the Baltimore and Ohio Railroad Company to construct a railroad through Pennsylvania, in a direction from Baltimore to the Ohio river."

"SEC. 9. *And be it further enacted, by the authority aforesaid*, That, as a condition on which this act is granted, it shall be the duty of the said company, in case the railroad aforesaid, made in this commonwealth, in pursuance of this act, shall not terminate at the Ohio river, in the vicinity of Pittsburg, to construct a lateral railroad, simultaneously, on the same principles and plans of the main railroad, and which shall connect the city of Pittsburg with the main railroad."

Extract of the Charter granted by the Commonwealth of Virginia to the Chesapeake and Ohio Canal Company, on the 27th Jan., 1824.

"SEC. 10. *And be it enacted*, That the President and Directors of the company, hereby created, shall have power, and it shall be their duty, to

ordain and establish a rate of tolls, to be paid upon boats, vessels, rafts, or other property, passing on the part of the canal so completed, and so, from time to time, as part or parts shall be completed, and until the eastern section thereof shall be finished up to the mouth of Savage river, or creek, and thereafter, until the entire canal shall have been finished, according to the true intent and meaning of this act. For the collection of which tolls, the President and Directors shall have power to establish so many toll-houses, and, at their pleasure, to appoint and remove so many collectors, and, at such places, as, from time to time, they may judge expedient; and the said President and Directors shall have full authority, subject to the direction and control of a majority, in interest, of the stockholders represented in any general meeting, to regulate and fix a tariff of tolls, not exceeding an average of *two cents per ton*, per mile; and so to adjust the said tolls, in relation to the capacity or burthen of the boats, and the dimensions of the rafts passing the locks of the said canal, as to promote economy of water and time in the navigation thereof."

"SEC. 14. *And be it enacted*, That the said canal, and the works to be erected thereon, in virtue of this act, when completed, shall forever thereafter be esteemed and taken to be navigable, as a public highway, free for the transportation of all goods, commodities, and produce, whatever, on payment of the tolls, to be imposed, as provided by this act; and no other toll or tax, whatever, for the use of the said canal, and works thereon erected, shall, at any time hereafter be imposed, but by consent of the said States, and of the United States."

Extract from the proceedings of the Chesapeake and Ohio Canal Convention, held at the City of Washington, on the 6th of December, 1826.

"Among others who appeared as delegates to the said convention, were the following gentlemen:

From Baltimore City.

PRESENT:

SOLOMON ETTING,	ISAAC McKIM,
BENJAMIN C. HOWARD,	JOS. W. PATTERSON, and
WILLIAM LORMAN,	PHILIP E. THOMAS.

"The following gentlemen, also appointed delegates to the convention, by the City of Baltimore, were

ABSENT:

THOMAS ELLICOTT,
ROGER B. TANEY, and
LUKE TIERNAN.

"The Central Committee having made their report, recommending the adoption of certain resolutions, and the first of the said resolutions being under consideration, to wit:

"*Resolved*, That it will be expedient to obtain such an amendment of the charter of the Chesapeake and Ohio Canal Company, as shall authorize

the company to terminate, if they deem proper, the eastern section of the said canal, at, or near the town of Cumberland; and to extend, by any route therefrom, the western section of the said canal across the Alleghany to Pittsburg, or to substitute therefor a railway. And in the event that such a change shall be deemed expedient, in the route now prescribed by the charter, to defer the extension of a canal along the Potomac, from Cumberland to the mouth of Savage, and to reduce the dimensions thereof to a breadth less than that now required.

"Mr. Kennedy moved to strike out the words '*or to substitute therefor railway.*'

"Mr. Key moved to add, 'or such other mode of transportation as they may find expedient.'

"Mr. Kennedy's motion was negatived.

"The resolution was adopted, by adding to the resolution of the Central Committee, after the word 'railway,' or turnpike road on that portion of the route, or any part thereof, designated in the report of the Board of Internal Improvement, of the 23d of October, 1826, as the middle section, or on that part of the route by Savage, which corresponds therewith.

"The second resolution recommended by the Central Committee, in the following words, was then taken up:

"*Resolved*, That it will be expedient to address a memorial to the Congress of the United States, requesting a subscription to the stock of the said canal; and a like memorial to the Legislatures of Virginia, Maryland, and Pennsylvania; and that an application be made to the cities of Washington, Georgetown, and Alexandria, to aid, by a similar subscription, the stock of the said company.

"On motion by Mr. Etting, the word 'Baltimore' was added after the word 'Alexandria,' in the foregoing resolution."

"The foregoing resolutions were, it is believed, adopted *unanimously* by the Convention.

Extract of the act of the Legislature of the State of Maryland, "incorporating the Chesapeake and Ohio Canal Company," passed at December session, 1826.

"Sec. 2. *And be it further enacted*, That the Chesapeake and Ohio Canal Company shall have power to terminate the eastern section of the said canal, at or near the town of Cumberland, on the river Potomac, and thence, to extend the western section thereof, in any direction that may be deemed expedient, by any other route, as well as that prescribed in the act aforesaid, towards Pittsburg, on the river Ohio; and, in extending the same in any direction across the dividing ridge which separates the eastern and western waters, to substitute, for a tunnel and numerous locks on such part of the route, inclined planes and railways, or any other artificial communication or roads; and, in the event that the western section of the Chesapeake and Ohio Canal shall leave the valley of the Potomac river at any point below the coal banks, at or near the mouth of Savage, on the North branch thereof, the company shall have the power, in like manner, to extend a branch from the main canal to the said coal banks, at or above the mouth of Savage, and to cause such branch to be constructed of such dimensions as

their views of their own and the public interest may warrant; and, for the construction of the same, shall have and enjoy the same rights, privileges, and immunities, under the same restraints and conditions, in all respects, as they are entitled to in relation to the main Chesapeake and Ohio Canal."

Extract of the act of the Legislature of the State of Pennsylvania, "incorporating the Chesapeake and Ohio Canal Company."—Passed February 9, 1826.

"SEC. 4. *And be it further enacted*, That the said Chesapeake and Ohio Canal Company shall have full power and authority to alter and change the route of the western section of the said canal, so that the same may commence at the town of Cumberland, situated near the junction of Wills' creek and North Branch of the Potomac, and be continued from thence, by the valley of Wills' Creek and Castleman's River, to the Youghiogeny, and from thence to the city of Pittsburg: *Provided*, That the United States' Board of Internal Improvement, or a majority thereof, should deem and report that route to be the best."

Extract of the act of the Legislature of the State of Virginia, "giving the assent of this State to an act, to amend the act, incorporating the Chesapeake and Ohio Canal Company, as passed by the State of Maryland."—Passed February 26, 1827.

After reciting at large the act of the State of Maryland—

"SEC. 1. *Be it therefore enacted by the General Assembly of this Commonwealth*, That the assent of this Legislature in and to "the amendment to the act incorporating the Chesapeake and Ohio Canal, as contained in the foregoing act of the General Assemby of Maryland, is hereby as fully and completely given, as if the said amendatory act had been passed by this present General Assembly."

Extract of an act of the Congress of the United States, "to amend and explain an act, entitled 'An act confirming an act of the Legislature of Virginia, incorporating the Chesapeake and Ohio Canal Company,' and an act of the State of Maryland for the same purpose."—Approved May 23, 1828.

"SEC. 1. *Be it enacted by the Senate and House of Representatives, of the United States of America, in Congress assembled*, That the assent already given by the United States to the charter of the Chesapeake and Ohio Canal Company, by an act of Congress, entitled 'An act confirming an act of the Legislature of Virginia, entitled 'An act incorporating the Chesapeake and Ohio Canal Company; and an act of the State of Maryland, confirming the same,' shall not be impaired by any change of the route of the said canal, from or above the town of Cumberland, on the river Potomac, or the distribution thereof into two or more sections, at any time

hereafter, or any change in the dimensions of that part of the present eastern section, extending from Cumberland, or the mouth of Wills' Creek, to the mouth of Savage, at the base of the Alleghany, or any substitution which the interest of the Chesapeake and Ohio Canal Company may, in the opinion of the company, require to be made, of inclined planes, railways, or an artificial road, for a continued canal through the Alleghany mountain, in any route which may be by the company finally adopted therefor, between the town of Cumberland and the river Ohio."

Copy of a letter from C. F. Mercer, President of the Chesapeake and Ohio Canal Company, to General S. Bernard.

OFFICE OF THE CHESAPEAKE AND OHIO CANAL COMPANY,

WASHINGTON, *February* 21, 1829.

DEAR SIR: I beg leave to ask you if my recollection be correct of a conversation which I had with you and Captain Poussin, of the Corps of Engineers, more than two years ago, in which, adverting to the expected supply of water at the summit level of the Chesapeake and Ohio Canal, you suggested to me your opinion, in language to the following effect: "That if, in your report to the Department of War, you had sought to avoid too favorable a view of our enterprise, and that, if you had overrated the probable cost of the canal, you had as much underrated its supply of water, at the summit level, or proposed tunnel through the Alleghany."

From the importance, in the present state of our enterprise, of the fact to which this conversation related, I will thank you, in behalf of the Board of Directors of the Chesapeake and Ohio Canal Company, to let me know whether my statement of it be correct: and if not, or any different impression, in relation to its subject, has since arisen in your mind, what should be the extent of our confidence in the supply of water afforded at that summit, for locking, down the opposite vallies of the mountain to the Youghiogeny and Potomac rivers?

I have the honor to be, sir,
With high respect,
Your obedient servant,
C. F. MERCER,
President of the Chesapeake and Ohio Canal Company.

Gen. S. BERNARD,
Member of the Board of Internal Improvement.

Copy of a letter from General S. Bernard to C. F. Mercer, President of the Chesapeake and Ohio Canal Company.

WASHINGTON CITY, *February* 21, 1829.

SIR: In answer to your letter, I have the honor to desire you to reply to the Report of the Board of Internal Improvement, dated December 7th, 1826. In that report, it is distinctly stated that the minimum quantity of

water, yielded by Castleman's river, is sufficient to supply the summit level of the Chesapeake and Ohio Canal, as also its lockage for the maximum of trade.

Therefore, the Board have used, in their calculations, the elements of the smallest supply, compared to those of the greatest expense.

I have the honor to be, sir,

Very respectfully,

Your obedient servant,

BERNARD,

Brigadier General.

To the Hon. C. F. MERCER,

Pres't of the Ches. and Ohio Canal Co. Washington City.

21st Congress, 1st Session. [Doc. No. 94.] Ho. of Reps. Executive.

ACTS OF VIRGINIA—CHESAPEAKE AND OHIO CANAL.

MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES,

TRANSMITTING

Two Acts of the Legislature of Virginia, respecting the Chesapeake and Ohio Canal Company.

March 9, 1830.
Referred to the Committee on Internal Improvements.
April 24, 1830.
Bill reported, No. 441.

Washington, *March 9th*, 1830.

Gentlemen of the House of Representatives:

I submit to the consideration of Congress a letter of the Governor of Virginia, transmitting two acts of the General Assembly of that State respecting the Chesapeake and Ohio Canal Company.

ANDREW JACKSON.

EXECUTIVE DEPARTMENT,
Richmond, March 2d, 1830.

SIR: I do myself the honor of transmitting herewith to you, Sir, an authenticated copy of two acts of the General Assembly of Virginia—the one dated the 27th of February, 1829, the other the 13th February, 1830—respecting the Chesapeake and Ohio Canal Company, and respectfully request that you cause the same to be laid before Congress.

Be pleased, Sir, to accept assurances of my high considerations and respectful regards, &c.

WM. B. GILES.

General ANDREW JACKSON,
President of the United States.

VIRGINIA, *to wit:*

I, William B. Giles, Governor or Chief Magistrate of the State aforesaid, do hereby certify, and make known unto all whom it may concern, that George W. Munford, whose name is subscribed to the annexed document, is Keeper of the Rolls of the Commonwealth of Virginia, duly appointed and qualified according to law; and to all his official acts, as such, full faith, credit, and authority, are had, and ought to be given.

[SEAL.] In testimony whereof, I have subscribed my name, and caused the great seal of the State to be affixed hereto.

Done at the City of Richmond, the first day of March, in the year of our Lord one thousand eight hundred and thirty, and of the Commonwealth the fifty-fourth.

WM. B. GILES.

AN ACT

Further to amend the act incorporating the Chesapeake and Ohio Canal Company. Passed February 27th, 1829.

Be it enacted by the General Assembly, That the Chesapeake and Ohio Canal Company be, and they are hereby, empowered, whenever it shall be, in the judgment of the President and Directors thereof, expedient, in lieu of bridges, to substitute boats, properly fitted for the transportation of persons, wagons, and carriages, of every description, across the canal, wherever a public or private road shall render a bridge or ferry necessary, and such road cannot be conveniently conducted under the canal.

Be it further enacted, That the said President and Directors, acting in behalf of the said Company, and with the consent and approbation thereof, expressed at some general meeting thereof, in which a majority in interest of the stock of the company is represented, may sell, let, or otherwise dispose

of, any surplus water in any part of the said canal, or of any feeder or reservoir thereof, if they shall be of opinion that no injury will result therefrom to the navigation of the canal.

Be it further enacted, That wherever it may be necessary to form heavy embankments, piers, or moles, at the mouths of creeks, or along the river shore, for basins and other purposes, and the President and Directors may deem it expedient to give a greater strength to the same by widening them, and constructing them of the most solid materials, the ground so formed for such useful purpose, may, by them, when so improved, be sold out, or let for terms of years, as they may deem most expedient for the company, on such conditions as may direct the application of the proceeds thereof to useful purposes, and at the same time repay the necessary expense of the formation of such embankments, piers, or moles: *Provided*, That this power shall in no case be exercised so as to injure the navigation of the canal.

This act shall be in force, so far as it relates to the Eastern section of the said canal, on its receiving the assent of the Legislature of Maryland, and of the Congress of the United States, and shall be valid, as relates to both sections, on its receiving the further assent of the Legislature of Pennsylvania.

VIRGINIA,
City of Richmond, } *to wit:*

I, George W. Munford, Keeper of the Rolls of the Commonwealth of Virginia, do hereby certify that the foregoing is a true copy of the act above mentioned, passed by the Legislature, February 27th, 1829. Given under my hand, this 26th of February, 1830.

GEORGE W. MUNFORD,
Keeper of the Rolls of Virginia.

AN ACT

To amend the charter of the Chesapeake and Ohio Canal Company by authorizing the commencement of the Western section of the Canal. Passed February 13th, 1830.

Be it enacted by the General Assembly, That, whenever a majority, in interest, of the stockholders of the Chesapeake and Ohio Canal Company, shall, at a general meeting thereof, determine that it is expedient to commence the Western section of the said canal, they shall have power to authorize and require the President and Directors of the Company to cause the same to be begun, although the Eastern section of the said canal, shall not be, at such time, completed.

Be it further enacted, That the said President and Directors shall have authority, at such times and places as they may deem expedient, to open books for a conditional subscription to the stock of the said company, such condition to be, that the stock, so subscribed, shall be applied, exclusively, to the Eastern or to the Western section of the canal, as the subscribers may respectively prefer and direct: And in the event of any such subscription being obtained, the said President and Directors, to the extent thereof,

at least, shall apply all sums paid thereon, according to the terms of the condition annexed thereto, by the respective subscribers; and to no other purpose whatever. In all other respects whatsoever, the stock, so subscribed, shall be regarded as part of the general stock of the company, and entitle the stockholders subscribing the same to the same rights and privileges, and subject them to the same obligations, with the other stockholders, whose subscriptions are payable without condition as to their application to either section of the canal.

And be it further enacted, That no forfeiture of the charter of the said company, or of any right thence arising, shall be incurred by any delay on their part, to complete the Western section of the said canal, by reason of a commencement of the same before the completion of the Eastern section thereof, but the longest time shall be allowed the said company for the completion of the entire canal, which could lawfully be claimed by them in virtue of any delay of the commencement, or completion, of the Western section of the canal, authorized or permitted by the terms of their present charter.

Be it further enacted, and it is hereby declared, That the amendments to the charter of the Chesapeake and Ohio Canal Company, contained in this act, are made upon the express condition that no part of the capital stock in said company, heretofore subscribed, shall in any manner be applied to the construction of the Western section of said canal until the Eastern section is completed, but the same shall be altogether applied to the construction of the Eastern section thereof until the same is completed.

This act shall commence and take effect, as far as regards this Commonwealth, from the passage thereof; as regards the United States and the State of Maryland, on receiving the assent of the Congress of the United States and the General Assembly of Maryland thereto; and on its receiving the further assent of the Legislature of the State of Pennsylvania, shall be taken and deemed to be, in all respects, part of the charter of the Chesapeake and Ohio Canal Company.

VIRGINIA,
City of Richmond, } *to wit:*

I, George W. Munford, Keeper of the Rolls of the Commonwealth, aforesaid, do hereby certify, that the foregoing is a true copy of the act abovementioned, passed by the General Assembly of Virginia, February 13th, 1830. Given under my hand, this 26th day of February, 1830.

GEORGE W. MUNFORD,
Keeper of the Rolls of Virginia.

21st Congress, 2d Session. [Rep. No. 31.] Ho. of Reps.

CHESAPEAKE AND OHIO CANAL COMPANY.

MEMORIAL

OF THE

PRESIDENT AND DIRECTORS OF THE CHESAPEAKE AND OHIO CANAL COMPANY.

MAY 24, 1830.*

Read, and laid upon the table.

To the Senate and House of Representatives of the United States of America in Congress assembled:

The memorial of the undersigned, President and Directors of the Chesapeake and Ohio Canal Company, pursuant to a resolution of the stockholders in general meeting,

MOST RESPECTFULLY REPRESENTS:

That, in order to comply, if practicable, with the condition expressed in the fifth section of the act of the Legislature of Pennsylvania, incorporating the Chesapeake and Ohio Canal Company, (appendix A,) your memorialists have recently applied to the Legislatures of Virginia and Maryland for such a modification of the charter under which they act as will enable them, after receiving the further sanction of a majority of their stockholders, to commence the western section of the Chesapeake and Ohio canal before the eastern section shall have been completed. (App. B.)

In referring to the provision of the act of the general assembly of Pennsylvania, one of the parties to the charter of the company, seconded, as it has recently been, by the earnest petitions to your honorable body of many of the citizens of that Commonwealth, the undersigned have suggested, they believe, considerations which cannot fail to recommend the object of their memorial to your favorable regard.

As the resolution of the stockholders, (app. C.) and the obvious interests of themselves, and, consequently, of the United States, one of the largest subscribers to the funds of the company, have rendered it the duty of the memorialists to associate another object with that which they have suggested—a correspondent enlargement of the resources of the company—they proceed to bring to your notice the present condition and future prospects of the

* This memorial was presented at the last session, but, as the appendix was not prepared, it was not printed.

great enterprise confided to their management, so far as they may be deemed to have a pertinent bearing on the second purpose of this memorial.

The condition of the Chesapeake and Ohio canal, at the period of the general meeting of the stockholders in June last, is disclosed in the accompanying annual report of the President and Directors of the company; and the present state of the canal, as well as of the company's funds, will be seen in the annexed tabular exhibit and Treasurer's report, bringing down the estimates of the cost of the canal and the Treasurer's account to the present time. (App. D.)

From this evidence, it will appear that the construction of the canal has been contracted for as far west as forty eight miles from Washington; that the canal, between its first and second feeders, is expected to be brought into use by the first of July next; and that its construction has so far proceeded as to render certain the execution of that portion of the work which the injunction of the Court of Chancery of Maryland has not inhibited the undersigned from placing under contract, for a sum, which, allowing for the enlargement of its dimensions, does not greatly exceed the estimate of the civil engineers, Messrs. Geddes and Roberts, nor that of the central committee of the late Chesapeake and Ohio Canal Convention, from whose proceedings the charter of the Chesapeake and Ohio Canal Company originated. (App. Nos. 7, 8, and 9.)

When it is known, as may be demonstrated, that the 48 miles of the canal, the computed cost of which has been, so far, verified by experience, comprehends a more than average proportion, for that distance, of the most difficult and expensive work to be encountered on the eastern section of the canal, your memorialists will not be regarded as too sanguine if they express the confident hope of being able to finish that section for a sum not much surpassing the least of those estimates; and this, notwithstanding the addition of one foot, throughout the whole eastern section, to the depth of the canal, beyond even the largest dimensions contemplated by those engineers or by the convention. (App. E.)

The estimates of the former were applied, respectively, to three canals, or to three several dimensions of a canal, passing as nearly as practicable over the same ground. The estimate for the first of these, having the same plan with the State canals of New York, Pennsylvania, and Ohio, viz: being 40 feet at the surface and four feet deep, and extending from Georgetown to Cumberland, a distance of 186¾ miles, amounts to the sum of $4,008,005\frac{28}{100}$ dollars, or $21,461\frac{87}{100}$ dollars per mile; of one, extending the same distance and along the same shore of the Potomac, with a breath of 48 feet at the surface and a depth of five, they compute at $4,380,991\frac{68}{100}$ dollars, or $23,191\frac{38}{100}$ dollars per mile; and of a third, of the same depth with the second, but having for 126 of the 186¾ miles a breadth at the surface of sixty feet, and at bottom of 42, they compute at $4,479,346\frac{73}{100}$ dollars, or at $23,985\frac{79}{100}$ dollars per mile.

The difference between these estimates, when compared with the relative resistance to be encountered by the same boat in passing along these several canals, induced, not only a preference of the largest of the preceding canals, but an enlargement of that to a depth of six feet, except in cases where peculiar difficulties are to be encountered at a much enhanced cost. (App. F.) Accordingly, the 48 miles of canal placed under contract is to be no where less than six feet deep; and, except for three-fourths of a mile, made up of short spaces, here and there, along that line, where it is reduced in breath to less

than sixty, though never less than fifty feet, its least width at the surface is sixty feet, and at bottom forty-two feet, affording a cross section of 306 feet. It may be proper here to remark that the cross section of the New York canals is 136 feet only. The locks of the Chesapeake and Ohio canal are consequently one foot deeper, as they are ten feet longer, in their chamber, than those proposed by Messrs. Geddes and Roberts, and one foot deeper than those proposed by the United States Board of Internal Improvement; being calculated for boats of ninty feet length, having a draft of water of three feet eight inches, with a cross section of 50.4 feet, capable of carrying each, with facility, one hundred tons, and of being propelled by the labor of three horses.

The breadth of this canal being about 4½ times the breadth of the boat, and its cross section six times that of the boat, the latter will move with a moderate velocity, as on an indefinite expanse of water. (App. G.) But the undersigned extend their views beyond this result, and, turning to practical advantage the rock which abounds every where along the line of the canal, and which has so greatly enhanced its cost, they purpose, by walling the inner slopes of the canal, not only to obviate the necessity of future repairs, but also to fit this important line of communication between the east and the west for the use of steam as its propelling power.

On the Chesapeake and Delaware canal, the breadth of which was designed to be sixty, and its depth eight feet, a velocity of seven miles an hour has been already attained, and has superseded a resort to land transportation for persons, as well as property, across the peninsula between the cities of Baltimore and Philadelphia.

Economy, rather than velocity, being, however, the great desideratum in the transportation to market of the very heavy and bulky products of the American forests, mines, and agriculture, would have been accomplished without looking to this powerful agent; but, by the efficacy of steam, combined with the enlarged volume of the Chesapeake and Ohio canal, passage boats may be expedited on its surface with a rapidity surpassed, at present, only on the best improved mail roads of this or any other country. In this anticipation, your memorialists make no allowance for those discoveries which are daily surprising the world with new applications of art and science to human use and comfort. They forbear to rely on a very recent improvement of the structure of the boats on the Forth and Clyde canal, which is said to have extended the propelling power of a single horse to the transportation of burthens much surpassing all former calculations.

Should the views of your memorialists meet the approbation of the several parties to the charter of the Chesapeake and Ohio Canal Company, and the western section of the canal be begun at Pittsburg, and conducted up the Monongahela and Youghiogany rivers, the portion of the canal between that city and Connelsville may be first executed, being a distance of less than 60 miles.

A canal of 58¾ miles above Pittsburg, having a depth of six feet, with a breadth of sixty feet at its water line, and overcoming a descent of 146 feet 4 inches by nineteen locks, has been computed, by two practical civil engineers, Messrs. Roberts and Cuyer, of New York, to cost 1,718,633 dollars. (App. H.)

This estimate includes no allowance for land rights or fencing, but it computes the entire lockage at $1,000 the foot lift, the slope walls at more than one dollar the perch, and these two items, taken together, at more than a fourth of the entire sum above mentioned; while the heavier expense of *ex-*

cavation and *embankment*, constituting together more than a moiety of the whole cost of the canal, are computed at more than the actual cost of the like items upon the eastern section of the Chesapeake and Ohio canal. (App. I.)

The average cost of more than 3½ millions of yards of embankment exceeds 18 cents, and of 2 millions of yards of excavation, 12 cents, the cubic yard. The preceding sum may, therefore, be considered as the maximum cost of so much of the western section of the Chesapeake and Ohio canal; and with the liberal patronage of the United States, and such further aid as the State of Pennsylvania, and individual enterprise within that Commonwealth, and elsewhere, may afford, will be, it is hoped, speedily supplied.

Having thus completed one half of the portion of the canal between the western extreme of the summit level and Pittsburg, there will remain but 27 miles of the other moiety of this distance to be provided for, in order to reach the mouth of Casselman's river, a point, on the line of the canal, in the vicinity of the Cumberland road, and, by the route of that road, about 44 miles from Cumberland, the termination of the eastern section of the Chesapeake and Ohio canal—by the route surveyed for the canal, about 67 miles—thirty-one of which lie between the mouth of Casselman's river and the western basin of the summit level.

It is apparent, therefore, that there will be several stages of the work where a pause may be made in its prosecution, without the loss of benefit, from the portion of it which will have been completed. To this view may be superadded the highly important consideration, that the part which will have been accomplished will afford increased facilities for the more speedy and economical construction of the residue, and in the interim will contribute, by its profit, to the general revenue of the company.

Your memorialists, having explained the motives which prompted the adoption of a plan of such enlarged dimensions for the eastern section of the canal, in order to obviate objections to the immediate commencement of the western section, beg leave to return to the estimate of the probable cost of the former. With a view of showing the competency of the funds, on which a reliance has been hitherto had, for the completion of this section of the canal, they proceed to demonstrate, or to render probable at least, the truth of their statement as to the proportion which the cost of the part of this section now under contract, being that to the east of the "Point of Rocks," may be expected to bear to the greater portion, extending to the west of that point, and east of Cumberland, along which their progress has been obstructed. For this purpose, they present the following considerations:

Not only have the provisions hitherto consumed on the canal been transported a considerable distance, but nearly all the hydraulic lime for its costly aqueducts and its numerous locks and culverts has been obtained from the New York canals, or from the Potomac quarries near Shepherdstown, about 25 miles west of the "Point of Rocks," by an obstructed navigation, sometimes doubling its prime cost at the kilns on the river shore. Much of the stone for this masonry has been alike transported by an obstructed navigation, and no small part of it by land, for great distances and at great expense. Two dams one, of them exceeding half a mile in length, have been required across the widest part of the Potomac, to force the water of that river into the necessary feeders: and the expense of their construction, as well as of two considerable*

* That of 7 arches across the Monocacy, computed to cost 100,000 dollars, and that of 8 across the Seneca, not less than 23,000 dollars.

aqueducts, and of 28 of the 72 locks required on the eastern section, are comprehended in the estimated or actual cost of the 48 miles of canal extending below the "Point of Rocks."

Two other causes have powerfully contributed to swell the expenses of the work already executed. The usual ill health, for a certain season of every year, of the valley of the Potomac, below the Kitoctin mountain, and the competition for labor on the canal with two works, the Baltimore and Ohio rail road, and the Susquehannah and Juniata canal of Pennsylvania—one approaching very near, and the other not one hundred miles distant from, the line of the Chesapeake and Ohio canal. Both causes have conspired, for two years past, to raise the wages of ordinary labor very far beyond the price anticipated when the estimates of the Washington Convention were made. One of these causes will, in a great measure, cease, after the canal shall have ascended the Potomac to the healthy country about the "Point of Rocks," and the final completion of the great State canal of Pennsylvania will shortly limit the operation of the other.

Without taking into account the probable reduction of the price of materials and subsistence, as well as of the wages of labor, in the more fruitful country above the Kitoctin mountain, your memorialists are sustained, as well by experience, as by comparison of the relative difficulties that were to be encountered by the canal below and above the Blue Ridge, in computing the cost of the first 60 miles, between Georgetown and Harper's Ferry, at more than a third of the entire expense of the eastern section.

For the twelve miles of this distance immediately below Harper's Ferry, not already placed under contract, they rely on the frequently repeated estimates of practical engineers, corrected by a reference to the cost of that part of the remaining 48 miles actually placed under contract, and either completed or very nearly so. Neither of these 12 miles, nor any part of the 126 miles above them, present obstacles more difficult to surmount than those which have been successfully encountered on the part of the eastern section about to be finished. They comprehend but a single dam across the river Potomac, where it is much narrower than at the feeders already constructed at Seneca and the Little Falls, and but three lift locks in addition to the 28 below the "Point of Rocks."

Assuming, therefore, the present enlarged plan of the Chesapeake and Ohio canal as the permanent basis of the dimensions of the entire work, and computing the total cost of the eastern section at thrice the cost of the 60 miles above Georgetown, between four millions and a half and five millions of dollars will be the probable amount required to reach Cumberland.

From this estimate, the work within Georgetown is excluded, under a conviction that the mole and basin within that town will repay all the expenses incurred there, except of the locks; as these, however, would have been required to descend to the tide, had the canal stopped above the town, they are comprehended in the estimate.

Of the four and a half or five millions so required, three millions six hundred and ten thousand dollars have been already subscribed, in the proportions of one million by the United States, a million and a half by the District cities, half a million by the State of Maryland, and six hundred and ten thousand dollars by private individuals, leaving the residue to be yet provided.

Of this residue your memorialists have always expected to receive at least seven hundred and fifty thousand dollars from that State which is most deeply in-

terested in this work, by the extensive inland navigation and commerce which she has dependent on its completion. This expectation remains unimpaired by the delay which has hitherto disappointed its fruition, since that may be ascribed, it is confidently believed, to causes transitory in their nature. For any deficiency of this sum which may remain to be supplied, it is supposed that an appeal might, at any time, be successfully addressed to private liberality, and to those local interests immediately involved in the completion of this great national undertaking.

In this view of the resources, present and future, of the Chesapeake and Ohio Canal Company, no reliance, it will be seen, is had, for the completion of the *eastern section* of the canal, on a further application for pecuniary aid to the Congress of the United States.

For the mountain or middle section, over which the Chesapeake and Ohio Canal Company are authorized to construct either inclined planes or a continued canal, your memorialists have, however, never ceased to indulge the confident hope of assistance from that Government which, created for the purposes of union and commerce, cannot be insensible to the claims of both upon the vigorous exercise of its powerful energies, to remove every impediment to the easy intercourse of the Atlantic and Western States through the centre of their common territory.

A plan for effecting this desirable object has already received the approbation of your memorialists, and is sustained, as they are advised, by a large proportion of your honorable body. (App. K.) Should it succeed, there will remain to be provided for but that portion of the western section of the canal between the Alleghany mountain and Pittsburg; and for that portion, the present appeal is most respectfully addressed to the enlightened patriotism of the Representatives of the States and people of America.

Should the western section of the canal be retarded in its progress from Pittsburg towards Cumberland, by a suspension of it, for any considerable period, at any one of the points suggested above; should it, for example, be prosecuted no further than the mouth of Casselman's river, it will even there have arrived within a few miles of the national road, which already connects the Youghiogany at Smithfield with the Potomac at Cumberland. Through the application of the various mineral treasures, apart from the productions of the agriculture and the forests of the country between Smithfield and Pittsburg, a part of the resources for the completion of this section would be speedily developed by the canal itself. It is, therefore, believed that, if a subscription be authorized by Congress for this purpose, to the extent of a single million, it will elicit a capital sufficient to defray the cost of all this central communication, except its summit level, and the descending planes or locks, which are designed to connect it with the lines of continuous canal stretching to the east and west from the base of the Alleghany mountain.

To open through this great barrier an easy avenue of trade and intercourse to millions, born and unborn, is of itself a work of such magnitude as to require it to be commenced on a plan of suitable dimensions, and with adequate resources for its steady prosecution and speedy completion. It is for this Government to sanction the one, since it is probable that it is alone competent to provide the other.

Your memorialists forbear, for the present, to enlarge upon this topic, and should here close the appeal which they have presumed to make to the wisdom of Congress in behalf of the western section of the canal, if they were not expressly called upon by a report of an enlightened committee of the

House of Representatives to consider and remove, if possible, an objection to their whole enterprise.

To the memorials of the numerous citizens of Pennsylvania who have prayed for the aid of the General Government towards the construction of the western section of the Chesapeake and Ohio canal, the Committee on Internal Improvements, to whom these memorials were referred at an early stage of the present session of Congress, have replied, "that they duly appreciate the great and national importance of a communication between the western waters and the navigable waters of the Chesapeake bay, as is manifested in their report of the 19th of February, 1830, on the memorial of the Baltimore and Ohio Rail Road Company."

The committee further state that, actuated by the same "desire, of affording to the Government a satisfactory *experiment* upon which it can decide whether a preference ought to be given to a canal or rail road, as the mode of conveyance over the mountains, they deem it inexpedient, at present, to make the appropriations, as the western communication, in the opinion of the committee, should correspond with the one leading over the mountains."

Such, the undersigned beg leave to remark, has not been the course of Pennsylvania, who is proceeding to connect, by a rail road of about 40 miles across the Alleghany, her Conemaugh and Juniata canals; nor that of the Hudson and Delaware Canal Company, who combine a railway of 11 miles, overcoming an elevation and descent of 1700 feet, with a canal exceeding in length one hundred miles, in order to reach the Lackawaxen coal mines and the North river; nor of the "Lehigh Coal and Navigation Company," who, for a similar purpose, have connected a canal and still water navigation of 47 miles on the Lehigh, with a rail road of 9 miles, between Easton, on the Delaware, and Mauch Chunk. This last mentioned work overcomes by its railway a descent of more than 700 feet, and has, in a distance of 47 miles of mixed navigation, 42 lift locks, 5 guard locks, and 7 dams. The use, moreover, of its railway long preceded, in point of time, the commencement of its canal. The undersigned aver that, at no period whatever, either before or since the prosecution of the great enterprise in which they are engaged, have they been unmindful of the progress of the science of internal improvement either in Europe or America.

Apart from the sudden, and, to them, most unexpected opposition of the Baltimore and Ohio Rail Road Company, to the construction of the Chesapeake and Ohio canal along the route so frequently surveyed, and so long appropriated to its use, and by so many indications of public opinion, every motive of personal interest, as well as of public duty, prompted the friends of the latter to institute a just comparison between those rival modes of internal communication.

While the first proceedings of the founders of the rival enterprise of Baltimore disclosed the grounds of their preference of a communication with the west by *a direct rail road*, rather than by the indirect course of the Chesapeake and Ohio canal, along the winding valley of the Potomac, the friends of the latter had no motive to deceive themselves or others. If such a communication were likely to supersede the use of the canal, while the former kept its avowed direction, and could not possibly interfere with the latter, the undersigned had not the *power* to arrest its progress, had they even felt or manifested the disposition. They, accordingly, consulted all the information which the essays of scientific writers, or the actual experience of Europe

or of America, could supply, in relation to the relative advantages of these different modes of communication. They not only availed themselves of the matured judgment and counsels of practical civil engineers, but carefully inspected all the materials for a correct decision upon this interesting subject, which the advocates of the "*direct rail road*" from Baltimore to the Ohio could themselves supply. (App. L.)

These inquiries ended in a conviction, which yet remains unshaken, that such a canal as they have planned and partly executed will furnish a much cheaper mode of transporting the heavy products of American industry than any rail road whatever, and especially than one the cost of which shall not much exceed that of the Chesapeake and Ohio canal. In this opinion, they are fortified by all the recent information which they have been able to obtain from Europe or America, as well as by the continued practice of various incorporated companies, States and nations. Let it be remarked that not a single canal in Europe or America has yet given way to a rail road. From those very rail ways, in America, on which reliance was early had to establish the superior advantages of rail roads over canals, abundant testimony has been lately derived to disprove the truth of this position, (app. M;) while the reference, so often repeated, to the incomplete experiment now in progress, between the chief western port of England, and her richest inland manufacturing town and most extensive mineral and manufacturing district, if it manifests any thing conclusive on this subject, shows the utter unfitness of this species of communication to the very uneven as well as unimproved surface of the country between the tide of the Atlantic and the Ohio, and to the present condition of the wealth, arts, and population of the United States.

In conformity with these sober and deliberate conclusions of the undersigned, is not only the past, therefore, but the still continued practice of the most enlightened States of the American Union, in all cases where canals are practicable, and no narrow interests or local jealousies arise to obstruct their execution. New York, Pennsylvania, Connecticut, and Ohio, may be confidently cited to sustain this authoritative appeal to experience.

A late report on the long contemplated and much desired union of the waters of the Delaware and Raritan adds to these authorities the weight of the Commonwealth of New Jersey, whose proceedings on this subject have been marked by so much prudence and circumspection. In the language of the committee to whom was referred the subject of the Delaware and Raritan canal, addressed to the House of Assembly of that State, in January, 1829, in answer to the suggestion that there is time enough to profit by additional experience, your memorialists admit that "science is daily improving," but, like the authors of that able report, they are not willing, and they trust that they will not be required, to delay a great national enterprise "till time ceases to shed new light," and "science pauses in her career." "*Time* is money," and *time is escaping*, are maxims applying with peculiar force to all such enterprises. The Chesapeake and Ohio canal, the long contemplated object of unceasing solicitude and unwearied labor, can be completed in five as readily as in fifty years. On the other hand, the *experiments* of the relative utility of rail roads and canals, which have already occupied more than one fourth of a century, are still, it would seem, regarded as inconclusive. Many years would be yet required, were the particular experiment instituted which the Committee on Internal Improvements have proposed, before it would be definitively settled, by the comparative cost.

for a series of years, of the annual repairs of the Baltimore and Ohio rail road, and of the Chesapeake and Ohio canal. As the one deteriorated by use, it might be found that the other would improve. The very question so often urged upon the public notice, touching the relative speed of transportation along two such lines of communication, could be tested only *by the long continued use of both*, with equal amounts of tonnage. (App. O.) That rail roads should be constructed in Great Britain, where canals have so long afforded a monopoly of enormous profits, and have appropriated to themselves every stream capable of being diverted from its natural channel to their support, furnishes no very conclusive argument in favor of their superiority in America, where the navigation of so many considerable rivers yet remains to be improved. Nor is the advance of rail road stock in England to fifty, or even to one hundred per cent. above par, at all more conclusive on this point; since, in the very same market, canal stocks are in some cases a hundred, a thousand, and even two thousand per cent. above par.

The time, though remote, may, and probably will arrive, in America, when *mere speed of transportation* will warrant the very heavy cost of constructing rail ways of such graduation, and of so many different tracts, as to admit of various velocities for persons and property moving in opposite directions, and of the substitution, on each of those tracts, of locomotive or even of stationary steam engines, of various powers, for the labor of animals. (App P.) When this period does arrive, it will be proper to legislate for it; and canals may then be profitably turned into rail roads.

With one other view of this subject, your memorialists will conclude this protracted appeal to your consistency, your justice, and your liberality. In asking the subscription which Congress has already granted to the Chesapeake and Ohio canal, it should not, if it could, be forgotten, that much reliance was had on the relation which the Legislature of the Union bears to the cities and people of the District of Columbia.

Separated from their parent States, in compliance with the earnest wishes of those States, and a solemn provision of the Constitution of the United States, they claimed a right to ask their exclusive Legislature to extend to them the fostering care of a paternal Government. Unwilling to call upon that Government for aid without manifesting the inclination as well as the ability to assist themselves, they have supplied to the stock of the Chesapeake and Ohio canal, by their corporate subscriptions, and by loans, which they were empowered by Congress to negotiate in Europe or America, a million and a half of dollars; and to this large amount, they have superadded, by individual contributions, half a million more.

The whole value of their subscribed stock, as well as their ability to meet the solemn engagements into which they have entered, must mainly depend, it is evident, on the completion of the great national enterprise to which there large contributions are now devoted.

When those subscriptions were made, the route of the Chesapeake and Ohio canal, throughout its entire course from Washington to Pittsburg, had been repeatedly designated, twice by skilful engineers, acting under the authority of the President of the United States, sustained by the resources, and countenanced by the approbation of Congress, whose subscription of a million was founded on the evidence of those surveys.

No mere *experiment* was *then* proposed to settle the *relative merits of rail roads and canals*. On the contrary, the subscriptions of all the stock-

holders of the Chesapeake and Ohio canal, as well as of the United States, was grounded on an implicit faith in the authority granted them to locate the canal along the left bank of the Potomac, on the estimated cost of its completion conformably to that location, and on the profit to be derived from its continuous prosecution, except in the mountain region, between Cumberland and the mouth of Casselman's river: between those points, and those points alone, a connexion, either by water or by inclined places, was expressly left open to the future decision of the stockholders themselves. It is not difficult to determine that no such subscription would have been made by the United States, by the States, the Corporations, or the individuals associated in this great work, if it had been even suspected, at that period, that the line of continuous canal was to be regarded as an experiment, or would be liable to be broken, in the midst of the valley of the Potomac, by the interference of a rival enterprise, seeking its destruction, in order to appropriate its expected profits to another undertaking, and its commerce to a different market.

These views are forced upon your memorialists by the report to which they have referred. They are here reluctantly, but most respectfully, presented to your consideration, in full confidence that the Congress of the United States will do what to their wisdom, shall seem just, towards the States immediately interested in the object of this memorial, to the Union at large, and to a people whose prosperity and happiness the American Constitution has confided exclusively to their guardianship, protection, and care.

Signed by order of the President and Directors, and in their behalf.

C. F MERCER,
Pres't of the Ches. & O. C. Comp.

May 24, 1830.

21st Congress, 2d Session. [Doc. No. 44.] Ho. of Reps.

CUMBERLAND ROAD AND CHESAPEAKE AND OHIO CANAL.

RESOLUTIONS

ADOPTED AT

A MEETING OF CITIZENS OF FAYETTE COUNTY, PENNSYLVANIA,

On the subject of the Cumberland Road and Chesapeake and Ohio Canal.

JANUARY 12, 1831.

Read, and referred to the Committee on Internal Improvements.

At a very numerous meeting of the citizens of Fayette county, Pennsylvania, held at the court-house in Uniontown, on the 5th January, 1831, the honorable Charles Porter was called to the chair, and Robert P. Henniken and Israel Miller appointed Secretaries. The object of the meeting being stated, on motion, the following gentlemen were appointed to report resolutions, &c. for the consideration of the meeting, viz: Andrew Stewart, Esq., Israel Miller, Herman Gebhart, Esq., James Bryant, Esq., and Alexander Wilson. The committee, after retiring a short time, reported the following preamble and resolutions; which were adopted unanimously.

Whereas, That portion of the Cumberland road between the towns of Cumberland and Wheeling is rapidly going to decay, and the transportation of the great eastern and western mails, as well as the public travel, thereby seriously interrupted; and as it is manifest, that, unless some system be speedily adopted by the Government for its preservation and repair, not only this intermediate portion of the road, with the immense sum expended in its construction, will be entirely lost to the country, but also the other portions, east and west, rendered in a great measure useless: And

Whereas, At no former period of our Government, have the resources of our country been as abundant as they are at present—it appearing from the late Treasury report that the national debt is nearly extinguished; and that, after defraying the ordinary expenses of Government, and discharging the national debt payable *in the present year*, including the balance of the United States Bank stock, there will still remain a residue of several millions, idle and unappropriated, in the Treasury: And

Whereas, The surplus could not be better employed than in preserving the great and valuable works of internal improvement already constructed, as well as advancing others now in progress: And

Whereas, When we look to the immense sums annually expended on the seaboard, in the erection of forts and fortifications, and in building and repairing ships, light-houses, sea-walls, beacons, buoys, &c., &c., every

principle of justice, as well as of sound policy, demands that some portion of the immense sums annually drawn from the people of the interior and the west should be returned to them for the benefit of trade, commerce, and friendly intercourse between the Atlantic and Western States, whereby they will not only be united and bound more firmly together, but also their property in peace, and their security in war, be greatly promoted: Therefore,

Resolved, That our Representative and Senators in Congress be requested to use their best endeavors to procure the passage of a law providing for the complete repair of the Cumberland road from Cumberland to Wheeling, and for its permanent preservation thereafter.

Resolved, That our Representative and Senators in Congress be requested to use every proper exertion to sustain the application, pending in Congress, for an appropriation of one million of dollars for the western section of the Chesapeake and Ohio canal

Resolved, That a committee of five be appointed to forward the proceedings of this meeting to our Representative and Senators in Congress, and to aid the object by the circulation of petitions or otherwise.

Resolved, That the foregoing preamble and resolutions be published in the papers of this district, and in the National Intelligencer and United States' Telegraph.

CHARLES PORTER, *Chairman*.

ROBERT P. HENNIKEN, } *Secretaries*.
ISRAEL MILLER, }

21st Congress, 2d Session. [Doc. No. 53.] Ho. of Reps.

CHESAPEAKE AND OHIO CANAL COMPANY.

MEMORIAL

OF THE

PRESIDENT AND DIRECTORS OF THE CHESAPEAKE AND OHIO CANAL COMPANY.

May 24, 1830.

Referred to the Committee on Internal Improvements, and ordered to be printed.

To the Senate and House of Representatives of the United States of America in Congress assembled:

The memorial of the undersigned, President and Directors of the Chesapeake and Ohio Canal Company, pursuant to a resolution of the stockholders in general meeting,

Most respectfully represents:

That, in order to comply, if practicable, with the condition expressed in the fifth section of the act of the Legislature of Pennsylvania, incorporating the Chesapeake and Ohio Canal Company, (Appendix A,) your memorialists have recently applied to the Legislatures of Virginia and Maryland for such a modification of the charter under which they act, as will enable them, after receiving the further sanction of a majority of their stockholders, to commence the western section of the Chesapeake and Ohio canal before the eastern section shall have been completed. (App. B.)

In referring to the provision of the act of the General Assembly of Pennsylvania, one of the parties to the charter of the company, seconded, as it has recently been, by the earnest petitions, to your honorable body, of many of the citizens of that Commonwealth, the undersigned have suggested, they believe, considerations which cannot fail to recommend the object of their memorial to your favorable regard.

As the resolution of the stockholders, (App. C,) and the obvious interests of themselves, and, consequently, of the United States, one of the largest subscribers to the funds of the company, have rendered it the duty of the memorialists, to associate another object with that which they have suggested—a correspondent enlargement of the resources of the company—they proceed to bring to your notice the present condition and future prospects of the

great enterprise confided to their management, so far as they may be deemed to have a pertinent bearing on the second purpose of this memorial.

The condition of the Chesapeake and Ohio canal, at the period of the general meeting of the stockholders in June last, is disclosed in the accompanying annual report of the President and Directors of the company; and the present state of the canal, as well as of the company's funds, will be seen in the annexed tabular exhibit and Treasurer's report, bringing down the estimates of the cost of the canal and the Treasurer's account to the present time. (App. D.)

From this evidence it will appear that the construction of the canal has been contracted for as far west as forty-eight miles from Washington; that the canal, between its first and second feeders, is expected to be brought into use by the first of July next; and that its construction has so far proceeded as to render certain the execution of that portion of the work which the injunction of the Court of Chancery of Maryland has not inhibited the undersigned from placing under contract, for a sum, which, allowing for the enlargement of its dimensions, does not greatly exceed the estimate of the civil engineers, Messrs. Geddes and Roberts, nor that of the central committee of the late Chesapeake and Ohio Canal Convention, from whose proceedings the charter of the Chesapeake and Ohio Canal Company originated.

When it is known, as may be demonstrated, that the 48 miles of the canal, the computed cost of which has been, so far, verified by experience, comprehends a more than average proportion, for that distance, of the most difficult and expensive work to be encountered on the eastern section of the canal, your memorialists will not be regarded as too sanguine if they express the confident hope of being able to finish that section for a sum not much surpassing the least of those estimates; and this, notwithstanding the addition of one foot, throughout the whole eastern section, to the depth of the canal, beyond even the largest dimensions contemplated by those engineers or by the convention. (App. E.)

The estimates of the former were applied, respectively, to three canals, or to three several dimensions of a canal, passing as nearly as practicable over the same ground. The estimate for the first of these, having the same plan with the State canals of New York, Pennsylvania, and Ohio, viz: being 40 feet at the surface and four feet deep, and extending from Georgetown to Cumberland, a distance of 186¾ miles, amounts to the sum of 4,008,065$\frac{28}{100}$ dollars, or 21,461$\frac{87}{100}$ dollars per mile; of one, extending the same distance, and along the same shore of the Potomac, with a breadth of 48 feet at the surface and a depth of five, they compute at 4,380,991$\frac{68}{100}$ dollars, or 23,191$\frac{38}{100}$ dollars per mile; and of a third, of the same depth with the second, but having, for 126 of the 186¾ miles, a breadth at the surface of 60 feet, and at bottom of 42, they compute at 4,479,346$\frac{73}{100}$ dollars, or at 22,985$\frac{79}{100}$ dollars per mile.

The difference between these estimates, when compared with the relative resistance to be encountered by the same boat in passing along these several canals, induced not only a preference of the largest of the preceding canals, but an enlargement of that to a depth of six feet, except in cases where peculiar difficulties are to be encountered at a much enhanced cost. (App. F.) Accordingly, the 48 miles of canal placed under contract is to be no where less than six feet deep; and, except for three-fourths of a mile, made up of short spaces, here and there, along that line, where it is reduced in breadth to less

than sixty, though never less than fifty feet, its least width at the surface is sixty feet, and at bottom forty-two feet, affording a cross section of 306 feet. It may be proper here to remark that the cross section of the New York canals is 136 feet only. The locks of the Chesapeake and Ohio canal are consequently one foot deeper, as they are ten feet longer, in their chamber, than those proposed by Messrs. Geddes and Roberts, and one foot deeper than those proposed by the United States Board of Internal Improvement; being calculated for boats of ninety feet length, having a draft of water of three feet eight inches, with a cross section of 50.4 feet, capable of carrying each, with facility, one hundred tons, and of being propelled by the labor of three horses.

The breadth of this canal being about 4½ times the breadth of the boat, and its cross section six times that of the boat, the latter will move with a moderate velocity, as on an indefinite expanse of water. (App. G.) But the undersigned extend their views beyond this result; and, turning to practical advantage the rock which abounds every where along the line of the canal, and which has so greatly enhanced its cost, they purpose, by walling the inner slopes of the canal, not only to obviate the necessity of future repairs, but also to fit this important line of communication between the east and the west for the use of steam as its propelling power.

On the Chesapeake and Delaware canal, the breadth of which was designed to be sixty, and its depth eight feet, a velocity of seven miles an hour has been already attained, and has superseded a resort to land transportation for persons, as well as property, across the peninsula between the cities of Baltimore and Philadelphia.

Economy, rather than velocity, being, however, the great desideratum in the transportation to market of the very heavy and bulky products of the American forests, mines, and agriculture, the purposes of this canal would have been accomplished without looking to this powerful agent; but by the efficacy of steam, combined with the enlarged volume of the Chesapeake and Ohio canal, passage boats may be expedited on its surface with a rapidity surpassed, at present, only on the best improved mail roads. In this anticipation, your memorialists make no allowance for those discoveries which are daily surprising the world with new applications of art and science to human use and comfort. They forbear to rely on a very recent improvement of the structure of the boats on the Forth and Clyde canal, which is said to have extended the propelling power of a single horse to the transportation of burthens much surpassing all former calculations, and to have expedited the speed of the passage boat to ten miles an hour.

Should the views of your memorialists meet the approbation of the several parties to the charter of the Chesapeake and Ohio Canal Company, and the western section of the canal be begun at Pittsburg, and conducted up the Monongahela and Youghiogany rivers, the portion of the canal between that city and Connelsville may be first executed, being a distance of less than 60 miles.

A canal of 58¾ miles above Pittsburg, having a depth of six feet, with a breadth of sixty feet at its water line, and overcoming a descent of 146 feet 4 inches by nineteen locks, has been computed, by two practical civil engineers, Messrs. Roberts and Cuyer, of New York, to cost 1,718,633 dollars. (App. H.)

This estimate includes no allowance for land rights or fencing, but it computes the entire lockage at $1,000 the foot lift, the slope walls at more than one dollar the perch, and these two items, taken together, at more than a fourth of the entire sum above mentioned; while the heavier expense of *ex-*

cavation and *embankment*, constituting together more than a moiety of the whole cost of the canal, are computed at more than the actual cost of the like items upon the eastern section of the Chesapeake and Ohio canal. (App. I.)

The average cost of more than 3½ millions of yards of embankment exceeds 18 cents, and of 2 millions of yards of excavation, 12 cents, the cubic yard. The preceding sum may, therefore, be considered as the maximum cost of so much of the western section of the Chesapeake and Ohio canal; and with the liberal patronage of the United States, and such further aid as the State of Pennsylvania, and individual enterprise within that Commonwealth, and elsewhere, may afford, will be, it is hoped, speedily supplied.

Having thus completed one half of the portion of the canal between the western extreme of the summit level and Pittsburg, there will remain but 27 miles of the other moiety of this distance to be provided for, in order to reach the mouth of Casselman's river, a point, on the line of the canal, in the vicinity of the Cumberland road, and, by the route of that road, about 44 miles from Cumberland, the termination of the eastern section of the Chesapeake and Ohio canal—by the route surveyed for the canal, about 67 miles—thirty-one of which lie between the mouth of Casselman's river and the western basin of the summit level.

It is apparent, therefore, that there will be several stages of this work where a pause may be made in its prosecution, without the loss of benefit, from the portion of it which will have been completed. To this view, may be superadded, the highly important consideration, that the part, which will have been accomplished, will afford increased facilities for the more speedy and economical construction of the residue, and, in the interim, will contribute, by its profit, to the general revenue of the company.

Your memorialists, having explained the motives which prompted the adoption of a plan of such enlarged dimensions for the eastern section of the canal, in order to obviate objections to the immediate commencement of the western section, beg leave to return to the estimate of the probable cost of the former. With a view of showing the competency of the funds, on which a reliance has been hitherto had, for the completion of this section of the canal, they proceed to demonstrate, or to render probable at least, the truth of their statement, as to the proportion, which the cost of the part of this section, now under contract, being that to the east of the "Point of Rocks," may be expected to bear to the greater portion, extending to the west of that point, and east of Cumberland, along which, their progress has been obstructed. For this purpose, they present the following considerations:

Not only have the provisions, hitherto consumed on the canal, been transported a considerable distance, but nearly all the hydraulic lime for its costly aqueducts and its numerous locks and culverts has been obtained from the New York canals, or from the Potomac quarries near Shepherdstown, about 25 miles west of the "Point of Rocks," by an obstructed navigation, sometimes doubling its prime cost at the kilns on the river shore. Much of the stone for this masonry has been alike transported, by an obstructed navigation, and no small part of it, by land, for great distances, and at great expense. Two dams, one of them exceeding half a mile in length, have been required across the widest part of the Potomac, to force the water of that river into the necessary feeders: and the expense of their construction, as well as of two considerable*

* That of 7 arches across the Monocacy, computed to cost 100,000 dollars, and that of 3 across the Seneca, not less than 23,000 dollars.

aqueducts, and of 28 of the 72 locks required on the eastern section, are comprehended in the estimated or actual cost of the 48 miles of canal extending below the "Point of Rocks."

Two other causes have powerfully contributed to swell the expenses of the work already executed. The usual ill health, for a certain season of every year, of the valley of the Potomac, below the Kitoctin mountain, and the competition for labor, on the canal, with two works, the Baltimore and Ohio rail road, and the Susquehannah and Juniata canal of Pennsylvania—one approaching very near, and the other not one hundred miles distant from, the line of the Chesapeake and Ohio canal. Both causes have conspired, for two years past, to raise the wages of ordinary labor very far beyond the price anticipated, when the estimates of the Washington Convention were made. One of these causes will, in a great measure, cease, after the canal shall have ascended the Potomac to the healthy country above the "Point of Rocks," and the final completion of the great State canal of Pennsylvania will shortly limit the operation of the other.

Without taking into account the probable reduction of the price of materials and subsistence, as well as of the wages of labor, in the more fruitful country above the Kitoctin mountain, your memorialists are sustained, as well by experience, as by a comparison of the relative difficulties that were to be encountered, by the canal, below and above the Blue Ridge, in computing the cost of the first 60 miles, between Georgetown and Harper's Ferry, at more than a third of the entire expense of the eastern section.

For the twelve miles of this distance immediately below Harper's Ferry, not already placed under contract, they rely on the frequently repeated estimates of practical engineers, corrected by a reference to the cost of that part of the remaining 48 miles actually placed under contract, and either completed or very nearly so. Neither of these 12 miles, nor any part of the 126 miles above them, present obstacles more difficult to surmount than those which have been successfully encountered on the part of the eastern section about to be finished. They comprehend but a single dam across the river Potomac, were it is much narrower than at the feeders already constructed at Seneca and the Little Falls, and but three lift locks in addition to the 28 below the "Point of Rocks."

Assuming, therefore, the present enlarged plan of the Chesapeake and Ohio canal, as the permanent basis of the dimensions of the entire work, and computing the total cost of the eastern section at thrice the cost of the 60 miles above Georgetown, between four millions and a half and five millions of dollars will be the probable amount required to reach Cumberland.

From this estimate, the work within Georgetown is excluded, under a conviction that the mole and basin within that town will repay all the expenses incurred there, except of the locks; as these, however, would have been required to descend to the tide, had the canal stopped above the town, they are comprehended in the estimate.

Of the four and a half or five millions so required, three millions six hundred and ten thousand dollars have been already subscribed, in the proportions of one million by the United States, a million and a half by the District cities, half a million by the State of Maryland, and six hundred and ten thousand dollars by private individuals; leaving the residue to be yet provided.

Of this residue, your memorialists have always expected to receive, at least seven hundred and fifty thousand dollars, from that State which is most deep-

ly interested in this work, by the extensive inland navigation and commerce which she has dependent on its completion. This expectation remains unimpaired by the delay which has hitherto disappointed its fruition, since that may be ascribed, it is confidently believed, to causes transitory in their nature. For any deficiency of this sum which may remain to be supplied, it is supposed that an appeal might, at any time, be successfully addressed to private liberality, and to those local interests immediately involved in the completion of this great national undertaking.

In this view of the resources, present and future, of the Chesapeake and Ohio Canal Company, no reliance, it will be seen, is had, for the completion of the *eastern section* of the canal, on a further application for pecuniary aid to the Congress of the United States.

For the mountain or middle section, over which the Chesapeake and Ohio Canal Company are authorized to construct either inclined planes or a continued canal, your memorialists have, however, never ceased to indulge the confident hope of assistance from that Government, which, created for the purposes of union and commerce, cannot be insensible to the claims of both upon the vigorous exercise of its powerful energies, to remove every impediment to the easy intercourse of the Atlantic and Western States through the centre of their common territory.

A plan for effecting this desirable object has already received the approbation of your memorialists, and is sustained, as they are advised, by a large proportion of your honorable body. (App. K.) Should it succeed, there will remain to be provided for, but that portion of the western section of the canal between the Alleghany mountain and Pittsburg; and for that portion, the present appeal is most respectfully addressed to the enlightened patriotism of the Representatives of the States and people of America.

Should the western section of the canal be retarded in its progress from Pittsburg towards Cumberland, by a suspension of it, for any considerable period, at any one of the points suggested above; should it, for example, be prosecuted no further than the mouth of Casselman's river, it will even there have arrived within a few miles of the national road, which already connects the Youghiogany, at Smithfield, with the Potomac at Cumberland. Through the application of the various mineral treasures, apart from the productions of the agriculture and the forests of the country between Smithfield and Pittsburg, a part of the resources for the completion of this section would be speedily developed by the canal itself. It is, therefore, believed, that, if a subscription be authorized by Congress for this purpose, to the extent of a single million, it will elicit a capital sufficient to defray the cost of all this central communication, except its summit level, and the descending planes or locks, which are designed to connect it with the lines of continuous canal stretching to the east and west from the base of the Alleghany mountain.

To open, through this great barrier, an easy avenue of trade and intercourse, to millions, born and unborn, is of itself a work of such magnitude as to require it to be commenced on a plan of suitable dimensions, and with adequate resources for its steady prosecution and speedy completion. It is for this Government to sanction the one, since it is probable that it is alone competent to provide the other.

Your memorialists forbear, for the present, to enlarge upon this topic, and would here close the appeal which they have presumed to make to the wisdom of Congress in behalf of the western section of the canal, if they were not expressly called upon, by a report of an enlightened committee of the

House of Representatives, to consider and remove, if possible, an objection to their whole enterprise.

To the memorials of the numerous citizens of Pennsylvania who have prayed for the aid of the General Government towards the construction of the western section of the Chesapeake and Ohio canal, the Committee on Internal Improvements, to whom these memorials were referred at an early stage of the present session of Congress, have replied, "that they duly appreciate the great and national importance of a communication between the western waters and the navigable waters of the Chesapeake bay, as is manifested in their report of the 19th of February, 1830, on the memorial of the Baltimore and Ohio Rail Road Company."

The committee further state, that, actuated by the same "desire, of affording to the Government a satisfactory *experiment* upon which it can decide whether a preference ought to be given to a canal or rail road, as the mode of conveyance over the mountains, they deem it inexpedient, at present, to make the appropriations, as the western communication, in the opinion of the committee, should correspond with the one leading over the mountains."

Such, the undersigned beg leave to remark, has not been the course of Pennsylvania, who is proceeding to connect, by a rail road of about 40 miles across the Alleghany, her Conemaugh and Juniata canals; nor that of the Hudson and Delaware Canal Company, who combine a railway of 16 miles, overcoming an elevation and descent of 1768 feet, with a canal exceeding in length one hundred miles, in order to reach the Lackawannock coal mines from the North river; nor of the "Lehigh Coal and Navigation Company," who, for a similar purpose, have connected a canal and still water navigation of 46 miles on the Lehigh, with a rail road of 9 miles, between Easton, on the Delaware, and Mauch Chunk. This last mentioned work overcomes, by its railway, a descent of more than 700 feet, and has, in a distance of 46 miles of mixed navigation, 47 lift locks, 6 guard locks, and 9 dams. The use, moreover, of its railway, long preceded, in point of time, the commencement of its canal. The undersigned aver that, at no period whatever, either before or since the prosecution of the great enterprise in which they are engaged, have they been unmindful of the progress of the science of internal improvement either in Europe or America.

Apart from the sudden, and, to them, most unexpected opposition of the Baltimore and Ohio Rail Road Company, to the construction of the Chesapeake and Ohio canal along the route so frequently surveyed, and so long appropriated to its use, and by so many indications of public opinion, every motive of personal interest, as well as of public duty, prompted the friends of the latter to institute a just comparison between those rival modes of internal communication.

While the first proceedings of the founders of the rival enterprise of Baltimore disclosed the grounds of their preference of a communication with the west by *a direct rail road*, rather than by the indirect course of the Chesapeake and Ohio canal, along the winding valley of the Potomac, the friends of the latter had no motive to deceive themselves or others. If such a communication were likely to supersede the use of the canal, while the former kept its avowed direction, and could not possibly interfere with the latter, the undersigned had not the *power* to arrest its progress, had they even felt or manifested the disposition. They, accordingly, consulted all the information which the essays of scientific writers, or the actual experience of Europe or of America, could supply, in relation to the relative ad-

vantages of these different modes of communication. They not only availed themselves of the matured judgment and counsels of practical civil engineers, but carefully inspected all the materials for a correct decision upon this interesting subject, which the advocates of the "*direct rail road*" from Baltimore to the Ohio could themselves supply. (App L.)

These inquiries ended in a conviction, which yet remains unshaken, that such a canal as they have planned and partly executed, will furnish a much cheaper mode of transporting the heavy products of American industry than any rail road whatever, and especially, than one, the cost of which shall not much exceed that of the Chesapeake and Ohio canal. In this opinion, they are fortified by all the recent information which they have been able to obtain from Europe or America, as well as by the continued practice of various incorporated companies and States. Let it be remarked that not a single canal, in Europe or America, has yet given way to a rail road. From those very railways, in America, on which reliance was early had to establish the superior advantages of rail roads over canals, abundant testimony has been lately derived to disprove the truth of this position, (app. M;) while the reference, so often repeated, to the incomplete experiment now in progress, between the chief western port of England, and her richest inland manufacturing town and most extensive mineral and manufacturing district, if it manifests any thing conclusive on this subject, shows the utter unfitness of this species of communication to the very uneven as well as unimproved surface of the country between the tide of the Atlantic and the Ohio, and to the present condition of the wealth, arts, and population of the United States.

In conformity with these sober and deliberate conclusions of the undersigned, is not only the past, therefore, but the still continued practice of the most enlightened States of the American Union, in all cases where canals are practicable, and no narrow interests or local jealousies arise to obstruct their execution. New York, Pennsylvania, Connecticut, and Ohio, may be confidently cited to sustain this authoritative appeal to experience.

A late report on the long contemplated and much desired union of the waters of the Delaware and Raritan adds to these authorities the weight of the Commonwealth of New Jersey, whose proceedings on this subject have been marked by so much prudence and circumspection. In the language of the committee, to whom was referred the subject of the Delaware and Raritan canal, addressed to the House of Assembly of that State, in January, 1829, in answer to the suggestion that there is time enough to profit by additional experience, your memorialists admit that "science is daily improving," but, like the authors of that able report, they are not willing, and they trust that they will not be required, to delay a great national enterprise "till time ceases to shed new light," and "science pauses in her career." "*Time* is money," and *time is escaping*, are maxims applying with peculiar force to all such enterprises. The Chesapeake and Ohio canal, the long contemplated object of unceasing solicitude and unwearied labor, can be completed, in five, as readily as in fifty years. On the other hand, the *experiments* of the relative utility of rail roads and canals, which have already occupied more than one fourth of a century, are still, it would seem, regarded as inconclusive. Many years would be yet required, were the particular experiment instituted which the Committee on Internal Improvements have proposed, before it would be definitively settled, by the comparative cost,

for a series of years, of the annual repairs of the Baltimore and Ohio rail road, and of the Chesapeake and Ohio canal. As the one deteriorated, it might be found that the other would improve by use. The very question, so often urged upon the public notice, touching the relative speed of transportation along two such lines of communication, could be tested only *by the long continued use of both*, with equal amounts of tonnage. (App. O.) That rail roads should be constructed in Great Britain, where canals have so long afforded a monopoly of enormous profits, and have appropriated to themselves every stream capable of being diverted from its natural channel, to their support, furnishes no very conclusive argument in favor of their superiority in America, where the navigation of so many considerable rivers yet remains to be improved. Nor is the advance of rail road stock in England to fifty, or even to one hundred per cent. above par, at all more conclusive on this point; since, in the very same market, canal stocks are in some cases a hundred, a thousand, and even two thousand per cent. above par.

The time, though remote, may, and probably will arrive, in America, when *mere speed of transportation* will warrant the very heavy cost of constructing railways of such graduation, and of so many different tracks, as to admit of various velocities for persons and property moving in opposite directions, and of the substitution, on each of those tracks, of locomotive or even of stationary steam engines, of various powers, for the labor of animals. (App. P.) When this period does arrive, it will be proper to legislate for it; and canals may then be profitably turned into rail roads.

With one other view of this subject, your memorialists will conclude this protracted appeal to your consistency, your justice, and your liberality. In asking the subscription which Congress has already granted to the Chesapeake and Ohio canal, it should not, if it could, be forgotten, that much reliance was had on the relation which the Legislature of the Union bears to the cities and people of the District of Columbia.

Separated from their parent States, in compliance with the earnest wishes of those States, and a solemn provision of the Constitution of the United States, they claimed a right to ask their exclusive Legislature to extend to them the fostering care of a paternal Government. Unwilling to call upon that Government for aid without manifesting the inclination as well as the ability to assist themselves, they have supplied to the stock of the Chesapeake and Ohio canal, by their corporate subscriptions, and by loans, which they were empowered by Congress to negotiate in Europe or America, a million and a half of dollars; and to this large amount, they have superadded, by individual contributions, half a million more.

The whole value of their subscribed stock, as well as their ability to meet the solemn engagements into which they have entered, must mainly depend, it is evident, on the completion of the great national enterprise to which their large contributions are now devoted.

When those subscriptions were made, the route of the Chesapeake and Ohio canal, throughout its entire course, from Washington to Pittsburg, had been repeatedly designated; twice, by skilful engineers, acting under the authority of the President of the United States, sustained by the resources, and countenanced by the approbation of Congress, whose subscription of a million was founded on the evidence of those surveys.

No mere *experiment* was *then* proposed to settle the *relative merits of rail roads and canals.* On the contrary, the subscriptions of all the stock-

holders of the Chesapeake and Ohio canal, as well as of the United States, was grounded on an implicit faith in the authority granted them, to locate the canal along the left bank of the Potomac, on the estimated cost of its completion conformably to that location, and on the profit to be derived from its continuous prosecution, except in the mountain region, between Cumberland and the mouth of Casselman's river: between those points, and those points alone, a connexion, either by water or by inclined planes, was expressly left open to the future decision of the stockholders themselves. It is not difficult to determine, that no such subscription would have been made by the United States, by the States, the Corporations, or the individuals associated in this great work, if it had been even suspected, at that period, that this line of continuous canal was to be regarded *as an experiment*, or would be liable to be broken, in the midst of the valley of the Potomac, by the interference of a rival enterprise, seeking its destruction, in order to appropriate its expected profits, to another undertaking, and its commerce, to a different market.

These views are forced upon your memorialists by the report to which they have referred. They are here, reluctantly, but most respectfully, presented to your consideration, in full confidence that the Congress of the United States will do what, to their wisdom, shall seem just towards the States immediately interested in the object of this memorial, to the Union at large, and to a people whose prosperity and happiness, the American Constitution, has confided, exclusively, to their guardianship, protection, and care.

Signed by order of the President and Directors, and in their behalf.

C. F. MERCER,
Pres't of the Ches. & O. C. Comp.

May 24, 1830.

APPENDIX.

A.

Act of the State of Pennsylvania, passed 9th February, 1826.

Sec. 5. *And be it further enacted by the authority aforesaid*, That, should the United States of America subscribe to the stock of the said Chesapeake and Ohio Canal Company, the said company shall, within six months after receiving the sum subscribed, commence the western section of the said canal, at such point or points as may be deemed most advantageous to the interests of the said company: and it shall be their duty to apportion at least one half of the subscription of the United States to the western section of the said canal; and whatever amount of stock may be subscribed by the citizens of Pennsylvania shall be expended wholly on the western section, unless authority is given to the said company by the Pennsylvania subscribers to expend their subscriptions differently; and in case of failure of the said company to comply with the provisions herein set forth, this act shall cease to have any force or effect whatever.

B.

An act of the State of Virginia, passed February 13, 1830.

Be it enacted by the General Assembly, That, whenever a majority, in interest, of the stockholders of the Chesapeake and Ohio Canal Company, shall, at a general meeting thereof, determine that it is expedient to commence the western section of the said canal, they shall have power to authorize and require the President and Directors of the company to cause the same to be begun, although the eastern section of the said canal shall not be at such time completed.

Be it further enacted, That the said President and Directors shall have authority, at such times and places as they may deem expedient, to open books for a conditional subscription to the stock of the said company, such condition to be, that the stock so subscribed shall be applied, exclusively, to the eastern or to the western section of the canal, as the subscribers may, respectively, prefer and direct. And, in the event of any such subscription being obtained, the said President and Directors, to the extent thereof, at least, shall apply all sums paid thereon according to the terms of the condition annexed thereto by the respective subscribers, and to no other pur-

pose whatever. In all other respects whatsoever, the stock so subscribed shall be regarded as part of the general stock of the company, and entitle the stockholders subscribing the same to the same rights and privileges, and subject them to the same obligations, with the other stockholders, whose subscriptions are payable without condition as to their application to either section of the canal.

And be it further enacted, That no forfeiture of the charter of the said company, or of any right thence arising, shall be incurred by any delay on their part to complete the western section of the said canal, by reason of a commencement of the same before the completion of the eastern section thereof; but the longest time shall be allowed the said company for the completion of the entire canal, which could lawfully be claimed by them in virtue of any delay of the commencement or completion of the western section of the canal authorized or permitted by the terms of their present charter.

Be it further enacted, and it is hereby declared, That the amendments to the charter of the Chesapeake and Ohio Canal Company contained in this act, are made upon the express condition that no part of the capital stock in said company, heretofore subscribed, shall, in any manner, be applied to the construction of the western section of said canal until the eastern section is completed; but the same shall be altogether applied to the construction of the eastern section thereof until the same is completed.

This act shall commence and take effect, as far as regards this commonwealth, from the passage thereof; as regards the United States and the State of Maryland, on receiving the assent of the Congress of the United States and the General Assembly of Maryland thereto; and, on its receiving the further assent of the Legislature of the State of Pennsylvania, shall be taken and deemed to be, in all respects, part of the charter of the Chesapeake and Ohio Canal Company.

C.

Resolution of the General Meeting of the Stockholders of the Chesapeake and Ohio Canal Company, 29th September, 1829.

And be it further resolved, That the President and Directors be instructed to ask the State of Pennsylvania and the Congress of the United States for subscriptions of stock to the Chesapeake and Ohio canal, with a view to the commencement of the western section thereof, and of the former, such further aid to the same object as, in their wisdom, they may deem it expedient to afford; and that the said President and Directors obtain, from the several parties to the charter of the com pany, such a modification thereof as may authorize them, with such funds and aids as may be acquired for that purpose, to commence the western section of the Chesapeake and Ohio canal before the completion of the eastern section thereof; provided that such commencement be not made without the special agreement of the stockholders, expressed in a general meeting, called to consider the expediency thereof, or in one of the annual meetings of the company.

D.

Annual Report of the President and Directors to the Stockholders at the general annual meeting in 1829, *accompanied by the Treasurer's report for May,* 1830.

The report of the President and Directors of the Chesapeake and Ohio Canal Company to the stockholders, at their extra meeting in September last, brought down a narrative of the transactions of the Board to the 10th of that month.

Seventeen miles and three quarters of the canal had then been distributed into thirty-four sections, and placed under contract.

The difficulty was seriously felt, of procuring, at that advanced period of the year, competent engineers to supervise the work already begun, and to prepare to extend the operations of the company higher up the Potomac. It was not until late in the following October that fifty additional sections, comprehending the remaining space between the head of Seneca Falls and the "Point of Rocks," could be let. On the 23d, 24th and 25th of that month, 1,308 proposals were received for these sections, and the various works of masonry upon the entire portion of the new canal between the Kitoctin mountain and its junction with the old Potomac canal, near the head of the Little Falls. Contracts for the masonry on the part of this line let in the preceding August had been delayed to await the discovery of stone in convenient situations, and of hydraulic lime of suitable quality, if to be found in the valley of the Potomac. Special agents were deputed to examine both shores of the river for these purposes; and the result of their labors, when ascertained, was published for the benefit of the contractors prior to the October letting; On the 5th of December, the residue of the line of the canal, being a space of about five miles between the Little Falls and the contemplated basin at the mouth of the creek separating Georgetown from Washington, was distributed into eight sections, and placed under contract, together with two dams across the Potomac at Seneca and the Little Falls, designed to supply the canal with water from the river.

The ninety-two sections thus let are comprised in the five residencies herewith exhibited, and which illustrate, as well the work actually done, as that required to complete the first forty-eight miles of the canal. In this distance are embraced two considerable aqueducts, about 60 culverts, two dams, 29 locks, 17 lock-keepers' houses, and several basins; among them, one of great capacity at the termination of the canal, sustained by an extensive mole, through which, a tide lock is designed to connect the navigation of the canal with that of the river Potomac, and its outlet to the ocean, the Chesapeake bay.

In the investigation instituted by the Board to ascertain the true position of the basin, in which it was proposed by the United States' engineers to terminate the Chesapeake and Ohio canal, and which had been referred to, as well in the report of Dr. Howard, a civil engineer, to the Executive Government of Maryland, as in the proceedings of several committees of Congress, and the act of that body authorizing a subscription of a million of dollars to the stock of the company, it was discovered that it had been designed to extend the basin to the ravine of Market street, in Georgetown, near the lower end of the section denominated B; so that, by the decision of the stockholders, at their extra meeting, the canal was extended but 2,276 feet

beyond the point required by the act of Congress, as well as by the interest of the principal parties to the charter of the company.

In the final adjustment of all the details of the plan approved by the general meeting for fixing the termination of the canal, a reference was kept in view to all the provisions of the recent compromise between the District Corporations, which had led to the settlement of the most embarrassing question, to the Board, that had occurred since its first institution. Ground has been provided for the eastern abutment of the Alexandria aqueduct; and such an elevation is proposed to be given to the water in the Rock creek basin, as, while it saves the cost of much excavation, will ensure to the present and future canal of Washington, at all times, an adequate supply of water, at such a level as its corporate authority may hereafter prefer.

The tide lock provided in the mole which is to sustain the water of Rock creek at this level will connect its navigation with the wharves of Georgetown above the basin, and those of Washington and Alexandria below; while a breadth and structure are given to the mole, by the disposition of the surplus earth from the excavation of the Georgetown sections, which, if judiciously applied, will more than repay, it is believed, the total cost of the extension of the canal through that town, and the residue of the section next above it.

Omitting those two sections, and their appurtenances, from the preceding consideration, on account of their peculiar object and structure, and there remain, of those under contract, ninety, extending over a distance of somewhat more than 46 miles. On seventy-one of these, as well as on the two extending through Georgetown, the contractors had entered upon their labors before the first day of May.

The 78th section, averaging, in depth, six feet cutting, was begun on the 15th of January, the middle of the late inclement winter, and completed on the sixth of May, so as to entitle the contractor to one of the premiums instituted by the Board to promote the progress of the canal, and to excite the emulation of the contractors engaged in its construction.

Since the first of May, the contractors for the nineteen remaining sections, some of whom had other work under way prior to that date, or who obtained their sections by reletting, have entered upon their construction, in some cases, with great vigor; and, in all, assurances have been given to Board that the delay which has occurred in entering upon any section shall not prove injurious to the company.

The estimates, which may be shortly expected, for the month that has just expired, would, it is believed, sustain these assurances; but the near approach of the annual meeting did not allow time to comprehend their results in the tables illustrative of the work actually done. These tables, combined with the recent calculations of the resident engineers of the quantities and qualities of the various works remaining to be done to complete the portion of the canal under contract, afford a nearer approximation to its probable cost than could have been before obtained; and it cannot be improper here to apply them to that purpose. They relate almost exclusively to the excavation, embankment, and exterior walling of the canal.

On the first of May, there had been completed the following work, at the prices set opposite to it, viz:

450,263 cubic yards of earth, gravel, and clay, excavated, comprehending loose stone, of a weight each less than what it would require two men to lift on a cart or wheelbarrow, at an average price, per cubic yard, of - - - - - -	Cents. $8\frac{53}{100}$

45,452 cubic yards of hard pan, at an average price, per cubic yard, of - - - - - - - - 21

14,437 cubic yards of rock quarried, at an average price, per cubic yard, of - - - - - - - - $28\frac{36}{100}$

43,930 cubic yards of rock blasted, at an average price, per cubic yard, of - - - - - - - - 53

39,378 cubic yards of embankment, formed of earth from the canal excavation, at an average price, per cubic yard, of - - $10\frac{76}{100}$

52,352 cubic yards of embankment, of earth not from the canal excavation, at an average price, per cubic yard, of - - $12\frac{93}{100}$

2,825 cubic yards of puddling, at an average price, per cubic yard, of - - - - - - - - $24\frac{21}{100}$

27,837 perches (of 25 solid feet) of external walling, of rock excavated from the canal, at an average price, per perch, of - $54\frac{82}{100}$

2,066 perches (of 24 solid feet) of external walling, of rock not excavated from the canal, at an average price, per perch, of - $92\frac{37}{100}$

The extra work, so far, has not exceeded in cost $1,035, while the total expenditures on those items alone amount to $114,221 69½.

The common average of every species of excavation, including every variety of earth, hard pan, and rock, is, as far as the work has gone, 13.58 cents per cubic yard;

Of embankment, whether of materials obtained from within or without the canal, 12 cents per cubic yard;

Of external, vertical, and slope wall, constructed of rock from within or without the canal, 57.42 cents per perch of twenty five solid feet.

A comparison of these prices with those on which were grounded, by the United States' engineers, that calculation of the cost of this canal so often adverted to with triumph by its enemies, and so discouraging, for a long time, to its friends, would stimulate the latter to increased exertion for its rapid execution. It may not be useless, at this late period, to refer to some of them.

The excavation of all the materials usually found in a canal is computed in that estimate, for the particular part of this canal now under contract, above the Little Falls, at $702,943 for 2,420,390 cubic yards; being at an average of more than 29 cents per cubic yard. The cheapest excavation, in this estimate, is of common earth, of the lightest description, at 14 cents.

The embankment, in quantity 441,140 cubic yards, is estimated at $75,400; affording an average price of more than 17 cents per cubic yard.

The stone walling is estimated in quantity at 139,245 perches of 25 solid feet each, and, in cost, at $473,812, or more than three dollars and forty cents the perch.

The first of these three averages exceeds the first of the former, for the corresponding excavation, in the ratio of 29 to 13.58, or much more than 2 to 1.

The average cost of embankment in the former estimate exceeds the corresponding average derived from the actual construction of part of the same work, in the ratio of 17 to 12 cents.

And the walling in the former estimate is computed at more than the actual cost of the same description of work in the latter, in the ratio of 340 to 57.42 cents, or near 6 to 1.

As to the quality of the work done, there can be, in the mere removal of earth, no great danger of imposition; but a wall constructing at the Great Falls, of fifty feet elevation, at 28 cents the perch, of massy stone, blasted

at 45 cents the cubic yard, attests alike the error of these early calculations, and the fidelity and ingenuity of the contractor. Even here, the canal exceeds in breadth the largest dimensions proposed by the United States' engineers.

After these analytical deductions from the cost of certain portions of this canal, it is proper that the Board should apprise the stockholders that the enlargement of the dimensions of the canal to sixty feet at its surface, with a breadth at bottom of 42, and a depth of water no where less than six feet in the 48 miles placed under contract, will cause so much of the Chesapeake and Ohio canal to cost a larger sum per mile than was anticipated by the Board at the last general meeting of the stockholders.

The single section already completed has been finished at a cost, indeed, several hundred dollars less than the prior estimate of the engineer; but the reduction, below the estimate of Messrs. Geddes and Roberts, of the cost of the part of this canal between the head of the Great Falls and the junction of the new canal with that of the former Potomac Company, will not be realised, in consequence of the discovery of materials in the excavation below the surface of the earth, which had not been expected, and of deviations from the plan of the canal itself, both as to its dimensions and its direction.

The changes of the last description are, in space, inconsiderable, but, in effect, calculated to improve the general course of the canal at the enhanced cost of its construction.

Stone of good quality has been found near the margin of the river, and hydraulic line immediately on its banks.

Among the earliest resolutions of the Board, after the October contracts, was one deputing a committee of engineers to inquire into the character of the water lime used on the various canals already executed within the United States, and to compare its strength, when used in cements, with that of the lime found on the Potomac shore. Their labor has ended in a perfect conviction of the excellence of that, near Shepherdstown, for the supply of which, a contract was made in the past winter. It is to be ground, and delivered to the boats engaged to receive it, at 17 cents the bushel. But such is the imperfect state of the navigation of the river, that much of the stone must be transported to the locks at a cost of two dollars the ton; and the transportation of the hydraulic lime, by boating, in the summer and autumnal months, will double, if not triple its cost to the contractor. The locks of the canal have, therefore, been nearly all relet at prices advanced twenty five per cent. upon those stipulated in the first contracts.

To ascertain the probable effect of these and other causes, referred to in another part of this report, in augmenting the cost of the ninety sections of the canal next below the Point of Rocks, or above the Georgetown sections, exact calculations, founded on the actual experience derived from the progress of the work, have been invited, and received from all the residencies but one,* and, making a rateable allowance for some augmentation of the cost of that portion of the canal which lies altogether above the Great Falls, a summary of the cost of the 46 miles will be found to give, for the grubbing, excavation, embankment, puddling, walling, locks, and lock-keepers' houses, aqueducts, culverts, and dams of the whole line, exclusive of bridges across the canal, of indemnities to the proprietors of the land, and materials used in its structure, of engineers' and officers' salaries, printing, ad-

* The returns having been received from this residency since this report was made, it is included in the summary of work done and to be done.—See Appendix.

vertising, fees of counsel, very near or quite 22,000 dollars the mile, and, adding all other charges, not less than 24,000 dollars.

Of this sum, the condemnation of the ground and materials along the ninety sections will amount, of itself, to one thousand dollars the mile.

In this last item, however, is comprehended a charge for fencing, which all the condemnations suppose to be supplied at the cost of the adjacent proprietor.

If the cost of the entire canal above the Georgetown sections shall average, per mile, the same price as the part of that line below the Kitoctin mountain, then the expense of reaching Cumberland will be somewhat, though very little, less than $4,400,000.

It is worthy of remark, that, without any reference, in the progress of this estimate, to that of Messrs. Geddes and Roberts, on a canal 60 feet wide at the surface, with but 5 feet depth of water, this estimate comes within $14 21 cents per mile of theirs, long since published.

As success in every great enterprise, whether of slow or rapid progress, depends on the stability with which it is conducted, and that essentially rests on a thorough understanding of the principles on which it is founded, and a steady adherence to them in its subsequent prosecution, the Board ask to be indulged in some reflections on the enlarged plan which they have, after much consideration, adopted, and partly executed, for the canal confided to their superintendence.

The plan for this canal originally pressed upon the Chesapeake and Ohio Canal Convention by a minority of that body, and derived from the suggestions of Messrs. Moore and Briggs, limited the breadth of water at its surface to 32 feet, and its depth to 4; and such are the actual dimensions of the plan adopted by the Commonwealth of Virginia for the extension of the canal of James river above its coal mines and the town of Lynchburg.

The convention fixed upon, and the charter adopted as a minimum, a breadth of 40 feet at the surface, with a depth of 4 feet water.

The engineers of the United States made their estimate for a canal which was to be generally 48 feet at the surface, with a depth of five feet. All allusion to the bottom of the canal is excluded from these details, because, the surface being given, it depends on the depth of water, and the inclination of the inner slope of the banks; and this must be determined by the nature of the earth through which the canal is conducted, unless its banks be sustained by an inner pavement or lining of stone or wood.

By this Board, it has been resolved to extend the breadth of the surface of the water in this canal, as far as Harper's Ferry, to 60 feet; its depth to 6, and its breadth at bottom to 42 feet; giving 306 feet for its cross section, and 59,840 cubic yards for the contents of its prism, for a mile in length, below its water line.

The dimensions of the New York, Pennsylvania, and Ohio canals give a cross section of 136 feet, and a water prism of 26,59$\frac{5}{9}$ cubic yards per mile.

The prism recommended by the United States' Board of Internal Improvement for the Chesapeake and Ohio canal, its cross section being 202.5 square feet, affords 39,600 cubic yards in the mile.

Notwithstanding the different dimensions of these plans, recommended, at various times, for the same canal, Messrs. Geddes and Roberts, civil engineers of established character, the last of whom, now in the service of this company, has been successively in that of the three States most distinguish-

ed in the career of internal improvement, New York, Pennsylvania, and Ohio, in a careful estimate of their probable cost, applied to the same ground, have computed the least in size, that of 40 feet breadth and four feet depth, at $21,461 87 the mile for a distance of 186 miles and three-quarters. the next at $23,191 38, and the largest, having a depth of five feet, at $23,985 79. The largest differs in dimensions from that preferred by this Board, in depth only. The breadth at their surface is the same, and that of their bottoms is determined by their depth, the inclination of their inner slopes being the same.

The urgent duties cast upon the engineers of the company, by the final location and superintendence of the canal after it was placed under contract, concurred with the manifest expediency of leaving, still open, small deviations from the line assumed for it, to delay the preparatory surveys for condemning the lands required for the use of the canal, where voluntary concessions or reasonable purchases of the necessary ground could not be made.

It was very soon apparent, that the expectation of large indemnities had arisen, among the proprietors of the ground and materials required for the canal, with the progress of the canal itself, and the certainty of its ultimate success. Efforts had been abortively made to profit by the uncertain hopes which preceded this state of absolute assurance. It was difficult to make them, with precision, as to the ground to be surrendered, because the final location of the canal, by the Engineer charged with it, remained uncertain till the moment of contracting for its execution, and even for some time after, so that promises antecedently given were afterwards, easily evaded. Some patriotic individuals, in the spirit of that provision of the charter of the company which now constitutes part of the standing law and usage of every State distinguished in the career of internal improvement, voluntarily surrendered their lands without price, in the hope of aiding the company by the influence of their example. But the far greater number early indicated a disposition to exact prices, for their property, which left the President and Directors no alternative, but a resort to the process of condemnation provided by the charter

The result of the proceedings of the various juries yet awaits the confirmation of the courts to which their inquests are returnable; but, so far as it has gone, will be found in the appendix. It being the disposition of the President and Directors to abide by the verdicts of the juries in all the enumerated cases, in some, the amounts awarded for damages have been already paid, where the reputed proprietors had a title, and were willing to receive them. In others, the proprietors perseveringly insist upon higher damages. In two cases, and two only, the attempt of the contractors to proceed, under their respective contracts, to the execution of their work, has been perseveringly resisted, and in one, that resistance has been countenanced by an injunction from a court of law.

In the estimate, already referred to, of Messrs. Geddes and Roberts, there is an allowance, as well for bridges, as fencing, though none for the condemnation of land and materials; and some of their aqueducts were designed to have wooden trunks. In the estimate here submitted of the probable cost of the more enlarged canal, founded on the best authority within reach of the Board, and in part, at least, on its actual construction, there is no allowance for bridges or fencing, but there is an allowance of $1000 per mile, or the first 46 miles, for land rights and the fences of the proprietors, and no wood or other perishable material, the use of which can be avoided, is allowed to enter into the structure of the deeper canal.

An analysis of the elements of the cost of any canal, and an examination of the principles which should regulate its location, when a choice of ground is open, would fortify the conclusions of recent experience, that the difference of the cost of two canals, conducted over the same ground, bears no direct proportion to the difference of their respective volumes or prisms of water; and this is true, though not always to the same extent, not only of their relative cost of excavation, embankment, and walling, but of their culverts, aqueducts, locks, dams, waste-weirs, and other masonry.

The cost of the culverts will be nearly in the direct proportion to their length, which will be determined by the breadth of the canal, and not by the contents of its prism of water.

The aqueducts will be adapted to the breadth of the locks, since that regulates the breadth of the boats; and the cost of the locks of the deeper canal will be enhanced only in proportion to the increased height of their side walls, breasts, and gates. In the lockage of this canal, one foot of masonry will be added to a wall of fourteen feet, and to some very inconsiderable extra expense in the construction of the gates; the whole not exceeding eight per cent. on the cost of a part only of the work of each lock, or less than $500 advance on the price of a lock of cut stone. The dams to force the river water into the feeders, and through them into the canal, will be the same in all respects, whether the canal be large or small; the short feeders, in this case, may require some inconsiderable enlargement, to supply the greater consumption of water by the larger canal, the depth of which, while, unless well constructed, it may increase its leakage, will decrease the relative proportion of its loss of water from evaporation.

In the excavation of a canal, where choice may be made of a suitable level, and correspondent positions for its locks, its cutting is shallower in proportion to the increase of its breadth; because the quantity of earth required, for its banks to be of sufficient height to hold and sustain its volume of water, is the measure of its excavation. Some cases arise, in passing over a very irregular surface, where a deep canal will cost even less than a shallow one, if the breadth be fixed, and, if the depth be fixed, a broad less than a narrow one. So true is this, that, in relation to some of the most expensive sections of the Chesapeake and Ohio canal, the advance of its cost, on that of the narrowest dimensions recently proposed for its plan, is least where the section is most costly. The same elevated side wall, as one of 50 feet at the Great Falls, would be necessary to sustain a canal of forty or fifty feet in breadth, as one of sixty; and where the intervening chasm, to be filled by embankment between the artificial wall and the opposite cliff, is very deep and narrow, the increase of the depth of the canal decreases the quantity of earth required to fill it up to the bottom. Between Bear Island and the opposite shore of the canal, there will be a body of water of the depth, in many places, of forty feet, and of a breadth exceeding one hundred. In many places of the same canal, there will be seen an enlargement of its breadth beyond sixty feet, to provide a sufficient quantity of earth for its towing path and embankments.

In cases where great additional cost would attend an enlargement of the canal to sixty feet, as where the bank opposite to the towing path is of solid rock, very difficult to remove, and an excavation of the proper depth, but narrower than sixty feet, yields enough of that material to sustain the outer embankment by walling, the breadth o the canal is reduced to fifty feet, Situations may be easily imagined, and, although none such have been en-

countered, may hereafter be found on this canal, wherein economy may recommend a contraction of its breadth to less than its present minimum.

But if any doubt existed as to the *relative cost* of canals of different cross sections or volumes of water, none any longer remains, if the size of their boats be fixed, as to the *superior facility* of the motion of those boats on broad and deep, rather than upon narrow or shallow canals. Science has, to a certain extent, sufficiently ascertained for practical use this interesting principle.

From the able report of the United States' engineers on the plan recommended by them for the Chesapeake and Ohio canal, the Board take pleasure in transferring to this, the following extract, which has often been referred to in the reports of the committees of the Chesapeake and Ohio Canal Convention, and of the House of Representatives, upon the same subject.

PLAN AND ESTIMATE OF THE CANAL.

The transverse section of the canal is exhibited on the sheet No. 3. The breath at the bottom is 33 feet; at the surface, 48 feet; the depth of water, 5 feet; the tow path, 9 feet wide; the guard banks, 5 feet at the top; the surf berms, kept on the level of water, 2 feet wide each; the tow path, and top of the guard bank, 2 feet above the surface of the canal.

This transverse section is to be modified where local circumstances require it, and more especially in the cases of deep cutting, steep side cutting, embanking, and also where the canal is supported by walls. In the framing of the plan, a due attention has been paid to these modifications, with a view to conciliate the convenience of the work with the strictest economy. The depth of 5 feet has been preserved throughout the line, but the breadth has been often much lessened. As to the surf berms, they are intended to protect the slopes from being washed off, as also to lessen the resistance opposed to the boat, by affording to the eddy water a free passage.

We must submit, however, the reasons which led us to propose the above dimensions.

The experiments made in 1775, by the French academicians (D'Alembert, Condorcet, and Bossut,) have shown: 1. That the resistance of water to the perpendicular motion of a given plane may be regarded as proportional to the square of the velocity; 2. That, the velocity being the same, the resistance of water may be considered as proportional to the area of the plane; 3. That these results obtained only in the case of an indefinite expanse of water; 4. That, in narrow canals, the resistance increases in a more rapid ratio than the square of the velocity.

To attenuate, as much as practicable, this inconvenience, researches have been made to ascertain what should be the ratio between the transverse section of the canal and the transverse section of the boat, in order that the boat might move through such a canal as through an indefinite expanse of water. Experiments made on the subject by the celebrated Chevalier Dubuat have shown that, to attain this result, the cross section of the canal ought to be, with moderate velocities, 6.46 times the cross section of the boat, and the water line 4½ times the breadth of the boat.

Adopting, to preserve uniformity, 13½ feet for the breadth of the boats used on the Chesapeake and Ohio canal, (which is the breadth of the Erie canal and of the Ohio canal boats;) if we suppose the draft to be three feet, the prow to be rectangular, and the sides and bottom of the boat to conform

to it, the cross section of the boat will be 40.5 square feet. Taking, now, this area 6.46 times, we find 261⅔ square feet for the cross section of the canal, through which the boat would not meet with a greater resistance than through an indefinite expanse of water. The water line should be 60¾ feet, that is, four times and a half the breadth of the boat.

Were not expense to be taken into consideration, these dimensions might be recommended; but fitness of the work and strict economy must be reconciled as much as practicable, and it is in such a view that smaller dimensions are to be fixed upon.

It is to be remarked, that the distance from Georgetown to Pittsburg, in following the line of canal, is 341¾ miles, which, at the rate of 2½ miles per hour, will be travelled in about - - - - - - - 136 hours
The ascent and descent, amounting together to 3,158 feet, will require, at the rate of 1 minute per foot, about - - 52

Distance, in time, from Georgetown to Pittsburg, - - 188 hours.

Though a number of canals, selected among those executed to this day, might afford together the distance and lockage found for the Chesapeake and Ohio canal, yet there is not, within our knowledge, any line of the same extent requiring even 1,800 feet of ascent and descent taken together; the Erie canal requires 688 feet for 362 miles; the line from Liverpool to London, 1,451¼ feet for 264 miles; the canal from the Rhone to the Rhine, connecting Lyons with Strasburg, has about 1,458 feet of lockage for a length of 200 miles. The proposed canal has, therefore, as to time, a decided inferiority, when compared to a canal of the same length, but having a less amount of lockage; and it becomes, in the present case, indispensable to remedy this inconvenience. The means we propose consist in the increase of the dimensions of the cross section of the canal, with a view to compensate by a greater weight transported without additional power for the virtual increase of distance caused by so great an amount of lockage.

We have shown that this section ought to be 261 square feet, with a water line of 60 feet, to procure a boat 13 feet 6 inches in breadth the advantage of moving on the canal as on an indefinite extent of water. After many trials and minute calculations, we have concluded to adopt, for the contemplated canal, the ⅘ of the foregoing results, viz: for the cross section, 208 square feet, and for the water line 48 feet; and from these data we have framed, with a depth of five feet, the general transverse profile of the canal, as exhibited on the sheet No. 3.

Let us now compare this profile to one having 40 feet at the surface, 28 feet at bottom, and 4 feet in depth—the boat used being the same for both, and having 13½ feet in breadth, and 3 feet draft.

We find by calculations, that, the velocity remaining the same, the resistance to the boat moving in the 48 feet canal, is to the resistance to the same boat moving in the 40 feet canal as 1.21 to 1.58, or as 100 to 130. Therefore, at the same rate of velocity, 100 horses will, on the 48 feet canal, perform the same work as 130 horses on the 40 feet canal; and, with the same towing power, the weight transported on the 48 feet canal will be to the weight transported on the 40 feet canal as 130 to 100.

But the depth of the 48 feet canal being one foot greater than the depth of the other, let us examine what will be the comparative resistance of the boat being immersed 4 feet into the 48 feet canal, and but 3 feet into the other. We find, in this case, the ratio to be 1.47 to 1.58, or 100 to 107,

and we infer from it that, with a gain of about seven per cent. of towing power, the weight transported on the 48 feet canal will be one-third greater than the weight transported, during the same time, on the 40 feet canal.

The foregoing considerations show, that, in determining the transverse section of a canal of great length, and with a dividing summit level, the amount of lockage must have a due influence upon the breadth and depth of the water section. And, indeed, taking into view the great distance and considerable lockage belonging to the present case, a cross section larger than that recommended might have been suggested, had not a regard to economy, and to a competent supply of water during the dry season, forbidden it.

However, the transverse section, as just proposed, may be deemed sufficient to fulfil, in a satisfactory manner, the main requisite for which it has been intended. And, in order to remove all doubt, let us compare, as to amount of transportation, the contemplated Chesapeake and Ohio canal with another of the same length, but whose lockage would be 600 feet only, with a transverse section of 40 feet at the surface, and 4 feet in depth.

The rate of travelling being supposed, for both, 2½ miles per hour, and one minute allowed for each foot of lockage, 60 feet will be, as to time, equivalent to 2½ miles; and these canals will then compare as follows:

The Chesapeake and Ohio canal, having 3,158 feet of lockage in a distance of 341¾ miles, is equivalent, as to time, to a single level canal of 473 miles, which would require 189 hours to be travelled from one end to the other.

The 40 feet canal, having 600 feet of lockage in a distance of 341¾ miles, is equivalent, as to time, to a single level canal of 367 miles, and which would be travelled in 146 hours, from one end to the other. But it has been shown, that, on the first canal, the amount of transportation being expressed by 130, it will be 100 on the 40 feet canal—the velocity and towing power remaining the same in both cases. Comparing, now, this ratio of 130 to 100 with that of the times employed to travel, respectively, each canal, viz: 189 hours to 146, it is found that these ratios are equal. Therefore, on either of these canals, and notwithstanding a difference of 2,558 feet lockage, an equal weight will be transported during the same time, and with an equal towing power; a result entirely due to a larger transverse section having been assigned to the canal whose lockage is greater."*

* After the enlarged dimensions of sixty feet by six feet for the volume of water in the canal, were recommended to the Committee of the House of Representatives on Roads and Canals, by the chairman, he addressed a letter of inquiry to Gen. Bernard, on the comparative resistance of the motion of a boat of given structure and burthen on such a canal, and one of the dimensions recommended by the board over which that officer presided. The annexed letter contains his answer to this inquiry:

Letter from Gen. Bernard to Hon. C. F. Mercer.

WASHINGTON CITY, *February* 17, 1827.

SIR: I have the honor to forward to you the result of the calculation you asked for, in relation to a canal 60 feet wide at the water line, 45 at the bottom, and 5 feet deep.

The cross section of the boat remaining as assumed in the report on the Chesapeake and Ohio canal, such a boat would, for the reason set forth in this report, move, at moderate velocities, on 60 feet canal, as on an indefinite extent of water.

The resistance proved, in this case, by the boat being expressed by 1, the number 1.21 will represent the relative resistance in a 48 feet canal, and 1.58 that in a 40 feet canal. Thus, with a towing power of 100 horses, the same work will be performed on the 60 feet canal as with 121 horses on the 48 feet canal, and 158 on the 40 feet canal—these two latter canals being here supposed to retain the respective cross sections assigned to them in the aforesaid report.

Now, assigning to these two canals the same comparative length and amount of lockage

The enlargement and elevation of the Chesapeake and Ohio canal, from the lowest dam and feeder to the entrance of the streets of Georgetown, have been prompted by a due respect for the well known object of the express condition attached to the United States' subscription of a million of dollars, added to the desire on the part of this board, sanctioned by the voice of the stockholders, of promoting the application of water power to domestic manufactures at the very advantageous sites afforded immediately above, as well as near, the termination of the canal.

It is well understood that this cannot be effected without some injury to the navigation of the canal, for the whole, or a part of that distance, and it should not be encountered without an equivalent benefit to the company, and to the community.

Should the pretensions of certain individual claimants, holding lands on both sides of the Potomac, to the exclusive use, for manufacturing purposes, of the water of this river, the highway, but recently, of two sovereign States, be not sustained, the profit to be derived to the company, from the proposed application of part of the water of the much enlarged canal, will amply repay the cost of its enlargement, while the public, as well as the stockholders, will be compensated for some delay in their ascent of this short portion of the canal, by the rapid growth of their common market. The company cannot be a loser, though the construction given by these claimants to the charter of the late Potomac Company be confirmed, by the judicial interpretation which they have sought of its true import, and of its subsequent modification by the charter of this company.

Still, it remains, in the judgment of the board, a question to be determined hereafter, whether the enlargement of the dimensions of the canal, beyond fifty feet, shall be extended above the mouth of the Shenandoah, and through its ascent to Cumberland.

As far, at least, as the former point, a prudent regard to the competition which this commercial avenue has to encounter, not only for the trade of the West, but of its own tributaries, the valleys of the Potomac, and of its navigable branches, required that the Board should avail themselves of all the aid which science could supply to fix this commerce in its natural channel.

The acquisition of at least sixty per cent. to the facility of transportation, upon the broader and deeper channel provided for the Chesapeake, and Ohio canal, is believed to be worth more than an advance of twenty per cent. upon the cost of its construction.*

as alluded to in the report, they become on the same footing as to towing power. But the 60 feet canal has the same length and amount of leckage as the 48 feet canal: therefore, it will have an advantage of 21, or 18 per cent. over the latter, as to towing power, and the same advantage over the 40 feet canal. In other words, 18 per cent. more weight would be transported during the same time, and with the same towing power, on the 60 feet canal, than on the two others.

I have the honor to be, sir, very respectfully, your obedient servant,

BERNARD, *Brig. Gen.*

To the Hon. C. F. MERCER, M. C. *Washington City.*

* By an early order of the President and Directors, it was determined to verify, by experiment, the relative advantages afforded to navigation in boats of given dimensions, by large and small canals. For this purpose, troughs were made, each 30 feet in length, designed, by their relative capacity, to illustrate the proportions of the New York and Ohio canals to the Chesapeake and Ohio canal.

Although the result of these experiments demonstrated the very great superiority of the larger over the smaller canal, so many defects were apparent in the manner of arriving at the results, that the Board determined to ascertain by the actual construction of a small part of the canal the exact difference of the resistance offered to the passage of a boat of given dimensions, and cargo, on these canals.

In the same spirit which has given these enlarged dimensions to the plan of the canal, the Board have diligently and laboriously sought, by negotiation and argument, as well as by appeals to legislative authority, to preserve the entire line of canal, above Georgetown, free from the dangerous, inconvenient, and costly obstruction of permanent bridges. The have invoked the interest as well as the patriotism of individuals, and the wisdom and policy of juries and legislatures. The appeal to the last has been in but one case availing; but they have been able to suspend the erection of any bridges for the present; and still seek, by the purchase of small tracts of land, lying between the canal and the river shore, to diminish the number of persons interested in opposing their wishes. Until a modification can be had of the charter of the company, conveyances for such parcels of land are proposed to be taken to trustees, for their future use.

The entire quantity of land, from the District of Columbia to the Kitoctin mountain, lying between that required for the canal and the river, was long since found, by actual survey, not to exceed 1,300 acres, of which, more than 500 are reported to be inarable. This land is not in one body, but in narrow slips, the property of numerous proprietors; and the erection and maintenance of permanent bridges for the accommodation of each, would, apart from obstructing the navigation of the canal, cost more than the land itself is worth, at any fair estimate of its value. From the Monocacy to the Point of Rocks, along the far better part of this country, the quantity of land, exclusive of the precipitous banks of the river, cut off from the main by the canal, does not comprehend fifty acres; for five miles, it does not exceed six acres; the canal having been generally, always where practicable, conducted along the margin of the river, as well to avoid these interruptions, as for the sake of better ground and a more ready access to the canal itself, from the opposite shore of Virginia. Although much more deeply interested in procuring a ready passage across the canal, than her neighbor, whose territory it immediately borders, this State has readily assented, where the company may deem it expedient, to the substitution of ferries, for bridges over the canal. Between Harper's Ferry and Georgetown, but few public highways at all interfere with such a provision. One of these may be provided for by a very elevated bridge, another, by a pivot bridge over a lock immediately crossing it; and in some cases, ferries, attended with no danger and very little delay, may be resorted to, with the approbation of the local authority charged with this branch of the public police.

Should the confident hope, inspired by intelligence, recently received from the canals of Europe, as well as of the United States, be confirmed, and it be found practicable to substitute, on this canal, steam, for animal labor, as its propelling power, its enlarged and unobstructed surface will favor, alike, economy of transportation and the comfort of the traveller; and render that, which is obviously the shortest, also the cheapest and the most agreeable channel of intercourse between the Eastern and Western States. Boats of elevated cabins and double decks, propelled by steam, will countervail, by a velocity of seven or eight miles an hour, the transient suspension of their motion by the locks; and by supplying the wants of every description of passengers, will afford, at the same time, cheap accommodation to the needy, and multiplied enjoyments to the rich. By such means will this improved channel of internal commerce, national in its end, as it is, in part, in the resources provided for its accomplishment, confirm the union of the States, without an undue increase of the power of their common government. And if, in the prosecution of such an object, som

expense may seem to have been encountered which parsimony might have denied, the patriotism from which this enterprise sprung, and on which it must continue to rest, will not, it is presumed, reject the powerful appeal which an enlarged economy in conducting such a work addresses to the Legislatures of the Federal Government, and of the States who share the cost of its prosecution with public spirited individuals. To these individuals themselves, the argument in favor of the plan adopted by the Board is as simple as it is intelligible, that a more costly canal, with an active navigation, will yield a better dividend than one of cheaper dimensions without any commerce whatever.

The long continued delay of the commencement of the Chesapeake and Ohio canal afforded an opportunity of profiting by the skill developed in the operations of similar enterprises in the United States, as well as abroad. To facilitate the acquisition of the fruits of this experience, the Board have resorted, in the selection of their engineers, to various States of the Union, as well as to foreign countries. Under the corps thus formed, a body of supernumerary youths have been placed, at the expense of their simple maintenance, in order to be trained for future employment. The uniform government sought, by the regulations of the Board, to be diffused throughout this corps, will diminish the labor of its administration as its members advance in knowledge, and give uniformity to the structure of the canal.

The entire line of canal placed under contract has been distributed into sections of about half a mile each. It is designed that one hundred and twenty of these shall make a *Division;* one-sixth part of that, a *Residency.* To each division are allotted one skilful engineer of high reputation, and an inspector of masonry. To each residency, an assistant, and a staff-bearer or rodman, with such volunteers as are training for more extended operations on a line of canal destined to connect the seat of the Federal Government with Pittsburg, the great emporium of the west. The engineers of the three divisions which compose the eastern section of this line, form, when required, a deliberative board, over which presides, as chief, the engineer of the first division. This division extends, at present, from the eastern termination of the canal to the base of the Kitoctan mountain, and is designed to reach the mouth of the Shenandoah.

The terms of all the contracts for the various works on the canal, as well as the relative dependence, distribution, and printed instructions of this corps of engineers, submit the materials and execution of the works of every description to regular, often repeated, and rigid scrutiny, which it is the siness of the Board to institute, and especially of its presiding officer to watch over and enforce.

To elicit a laudable competition among the contractors, a system of rewards for skill and diligence has been instituted, as has been already intimated; and its application has already been called into use.

The engineer of the 2d division has been ordered to revise the location and permanently lay down the route of the western section of the canal, pursuant to the instruction of the stockholders in a resolution of the first general meeting of the company. From him and his assistant, highly satisfactory letters have been received, (which will be found in the appendix,) calculated to remove any real doubt which has any where existed of a competent supply of water at the contemplated summit level of the canal.

Mr. Roberts was instructed, not only to examine and survey the mountain which divides the waters of the Ohio and Potomac, with a view to a

careful measurement of the length, and to an estimate of the probable cost of the proposed tunnel, but to trace the line of a railway over the same dividing ridge. A similar duty had been confided to him by the commissioners of the State of Pennsylvania, for a union of the canals of the Juniata and the Conemaugh, and had been performed in a satisfactory manner. The late letter of this gentleman apprises the Board that he deemed the order to survey the route of a railway for part of the western section of the Chesapeake and Ohio canal as contingent; and, finding an ample supply of water for the tunnel, he should defer it till further orders. It was earnestly desired by the Board, for various reasons, that the final report of the engineers charged with the above duty should be received early enough to be submitted to the stockholders at their present general meeting; but, although its character may be anticipated, there has not been time to complete it.*

The condition attached to the act of Pennsylvania incorporating the Chesapeake and Ohio Canal Company, that any subscription made by the United States to the stock of the company should be equally divided between the eastern and western sections of the canal, gives to this survey a very great importance; since a continued delay of the legislature of that State to relax any part of this condition may render it necessary to make another appeal to the liberality of Congress, preparatory to a commencement of the canal, from Pittsburg, towards the Alleghany. A memorial on this and other topics of interest to the company, was presented to the legislature of Pennsylvania at their last session. In this, reference was had to the prior memorial on the same subject, presented by the central committee of the Chesapeake and Ohio canal convention. On the prayer of neither memorial has there been, at any time, a decision known to any member of this Board.

Efforts have, in the interim, been made to assert and protect the rights of the company to the ground over which this part of the line of the canal was conducted by the United States' Board of Internal Improvement, and by the subsequent, though yet unfinished survey of Messrs. Geddes and Roberts, made under the order of the President of the United States, at the request of many members of the House of Representatives of the nineteenth Congress.

In anticipation of the possible determination of the stockholders, if adequate funds can be provided to commence the western section of the canal, the Board obtained for Richard Rush, Esq. late Secretary of the Treasury, who was about to visit Europe, an authority from the commissioners empowered by the United States and the States of Virginia and Maryland to open books of subscription to the stock of the company, to perform that duty, in their behalf, in Europe; and the Board authorized him to extend the subscription, after making up the first six millions of dollars, to the further sum of four millions, in conformity with one of the earliest resolutions of the stockholders after the organization of the company.

Memorials were presented to the legislatures of the several States who are parties to the charter of the company, and to the Congress of the United States, on the various topics recommended by the stockholders, and in relation to others suggested by the wants of the company, as the progress of the canal developed their importance. These memorials contemplated the exclusion of any constructive rights in any quarter, above the limits of Georgetown, to force the company to establish a bridge across the canal,

* The survey and report having been completed since this report was made, the result will be found at large in the appendix.

where, in the opinion of the President and Directors, it was inexpedient to do so; the acquisition of a right to dispose of grounds formed by heavy embankments on the margin of the canal, or of lands previously acquired by compromises entered into with the proprietors of the Potomac shores, to obviate the necessity of any other intercourse across the canal than by water; and the authority to draw supplies of water from the main river, in certain places, for manufacturing purposes, as well as for navigation, and to dispose of suitable sites for the former.

A favorable report upon the memorial to the General Assembly of Virginia, asking a subscription to the stock of the company, was accompanied by a bill, which was not, however, finally disposed of before the rising of that body, authorizing a subscription of $400,000 to the stock of this company, and of $100,000 to that of the Alexandria branch from the Chesapeake and Ohio canal.

A favorable report was also made by a committee of the House of Representatives on the memorial from this Board, and from a committee of the citizens of Alexandria, asking of Congress a charter to authorize the construction of that branch. Upon the contemporaneous memorial of the Board, inviting from Congress an extension of the Chesapeake and Ohio canal, from its highest level in Georgetown, along the rear of Washington, to the Navy yard, on the Eastern Branch, no report was made, in consequence of the delay of the survey and estimate for such a canal, and the difficulty of maturing the details of any bill upon the subject without the aid of the Executive Department of the Government. This department was earnestly invited to co-operate in the views, presented by the memorial, of the future bearing of the proposed canal upon the naval defences of the Chesapeake, and of its numerous rivers and harbors.

An explanatory act to authorize the canal contractors to employ Virginia slaves along the shore of Maryland, in prosecution of their work, was invited from that State, by one of these memorials. Their only fruit will be seen in the act of the legislature of Virginia contained in the appendix of this report; which also embraces copies of the several memorials referred to.

The scarcity of labor along the line of the canal placed under contract, and its consequent high price, threatening heavy loss to the contractors, or the necessary surrender of their contracts, was early apprehended by the Board; but the precautions which they provided did not meet with the countenance of those to whom their memorial was addressed: the ambiguity which rested upon the act of Maryland of 1794, in favor of the Potomac company, still exists; and the privilege of employing, for a limited period, slaves from the counties of Virginia bordering on the Potomac, is coupled with conditions that have proved unsatisfactory to their proprietors. Very few laborers are to be found on the canal from the neighboring State, notwithstanding the liberality of her slave laws towards her sister States, and the deeper interest of Maryland in a joint stock association, to the funds of which she has liberally subscribed, and in the prosperity of a canal, which, so far as it has advanced, passes through her territory, as it will continue to do, unless driven from it to the opposite shore of the Potomac.

At the date of the last of the weekly returns, required from the resident engineers, of the labor employed on their respective residencies, the number of hands, consisting of men and boys, engaged on the works of the canal, was 2,113, of which 2,000 were men, and the residue boys. The number necessary to complete the canal, under contract, in the time specified in

the several contracts, cannot be short of 6,000.* A few of the sections have been surrendered, and re-let; as have been all the locks, except two. The re-letting of the latter has augmented their cost to the extent already stated, and delayed their execution.

It is still, however, expected by the Board to finish, during the ensuing spring, so much of the line of canal under contract, as can be supplied with water from the Potomac, prior to a final removal of the obstruction thrown in the way of the company, by a rival enterprise.

From the Seneca dam to a short distance below Harper's Ferry, the canal will depend, for a supply of water, on the dam to be erected at the latter place, across the Potomac; unless a feeder shall be conducted up the Monocacy: from whence, this subdivision of the line might be filled, as high up, as the lock next above the Point of Rocks.

It had been announced to be the intention of the Board to place such a feeder under contract in October last; but, as its dimensions should depend on the application of it to purposes of navigation, it was postponed for a decision of the inhabitants of Frederick county, in Maryland, and of Franklin, Adams, and York, in Pennsylvania, under a late charter granted by the legislature of the former State, to fix upon the dimensions of a canal calculated to connect the Monocacy with the Conewago, of which, this feeder might be made to constitute an important part. The company would be repaid, it is believed, for its enlargement to suitable dimensions for that object, by the extension of the commerce of the main stem of the canal. A survey of the Monocacy was begun, at the instance of a committee of the citizens of Frederick, by order of the Board, with a view to this object: which survey, although arrested, before its completion, by the indisposition of the engineer, to whom it was at first confided, and the pressure of other duties, ascertained, beyond any doubt, the practicability of conducting, at a reasonable cost, a navigable canal from a point on the Monocacy, 29 miles above its mouth, through the city of Frederick, to the proposed feeder.

It does not form a necessary part, though the suggestion naturally occurs, at this point of this report, that a canal from Philadelphia now strikes the Susquehannah very near the place at which one along the Conewago would enter that river; and that, from a point of the former canal, near where it reaches the Schuylkill navigation, another canal is in contemplation, which will connect Reading, on the latter river, with Easton, on the Delaware, as that village already is, by the Morris canal, with the City of New York. Connected with the Monocacy feeder, this line would unite the seat of the Federal Government with the cities of New York and Philadelphia, by an avenue for purposes of war and commerce, entirely without the reach of a maritime foe, except at its extremes.

Such was the severity of the last winter, that the contractors, at the August letting, have not kept the start which they then obtained of those who delayed their work till the opening of the spring. The 5th residency, which reaches the disputed shore at the "Point of Rocks," is as present as forward in its progress as the first; and the company would sustain a serious pecuniary loss from a further delay of the final adjudication of the conflicting claims of the Baltimore and Ohio rail road company to the ground surveyed, under the authority of Congress, for the Chesapeake and Ohio

* Part of this deficiency may be regarded as supplied by the employment, at the same time, of 419 horses and 83 oxen, many of which are used as substitutes for the laboring men, in excavating the canal by ploughs and scrapers.

canal, and under that of the States of Maryland and Virginia, for the Potomac company, to whose rights, this company have succeeded. It may, therefore, be confidently expected, from the nature of the report itself —from the obvious interest of the State of Maryland in its speedy termination—that, if destined to pass, during the present summer, from the State courts to the chief tribunal of the United States, it may receive a prompt decision by the former, and be finally disposed of before the termination of the ensuing winter.

In anticipation of its result, a skilful engineer, retained in the service of the company, for whom, while waiting the issue of this controversy, other employment did not exist, was employed to prepare for contract one hundred sections of the line already traced for the canal above the Kitoctan mountain. This engineer was charged with an examination, at the same time, of the opposite shore of the river. A very careful report was made by him of the character of the ground on both shores of the Potomac, and a preference given to that of Maryland, in harmony with the opinions of all the engineers by whom he had been preceded. What was highly gratifying to the Board, the impression produced by this laborious examination and survey was, that no greater difficulties will attend the construction of the canal any where below Williamsport, than have been so far successfully encountered below the disputed ground.

A counter memorial to one from the Baltimore and Ohio rail road company was presented to both Houses of Congress by this Board, during the last Winter, to prevent a like occurrence on the western section of the canal, with that, which has arrested the extension of their contracts on the eastern; and it became necessary to obtain an injunction from a court of law to stay that company from proceeding, pursuant to a public advertisement, to let out the disputed ground beyond the "Point of Rocks."

The delay which has occurred in the application of the labor of the engineers to the services for which they were engaged, and the multiplication of legal controversies to whicl the President and Directors have been required to become a party, have increased the contingent expenses of the company, as much, as the scarcity of labor and the late unfavorable winter have diminished the regular and confidently anticipated expense of constructing the canal.

Efforts have been made, and are still continued, to remove this cause of delay, by the exertion of all the means in the power of the Board. They have, by a special agency abroad, offered facilities for the transportation of persons, and, by an extensive correspondence, invited labor from distant portions of the Union, as well as from various countries of Europe, and especially artificers in stone, capable of reducing the cost of the masonry of the canal, which has risen in price more than any other part of the works.

It may become the duty of a future Board to reduce the number of engineers in the service of the company, in case a decision of the legal question which has hitherto arrested the progress of the canal shall be much longer retarded. Could that question be promptly disposed of, an augmentation of this body would be preferable to its reduction, since much delay occurred in its formation; and it is highly expedient that the execution of all the works of the canal, and especially where heavy enbankments of earth, or elevated walls of stone, are to be constructed, should be early begun, and time allowed for them to acquire permanency before any water be admitted to endanger their stability.

The charter of the company requires that one hundred miles of the canal shall be finished in five years from the organization of the company; and the experience of several States of this Union demonstrates that, with adequate funds, the entire eastern section can be completed, as economy recommends that it should be, in the shorter period of three years from its commencement, the time which the Board had early assigned for that labor.

From causes of disquiet, the Board turn with pleasure to a view of the present state of the finances of the company.

The beneficial effect of the final settlement of the eastern termination of the canal, in a manner satisfactory to all the corporate authorities, and to the far greater part of the individual stockolders of the District of Columbia, was realized, in the fidelity with which the calls were obeyed for the payment of the instalments upon the subscribed stock, and the actual receipt, in a few months, of very near fifteen per cent. upon $3,600,000, the whole amount subscribed. These demands were made in anticipation of a more vigorous prosecution of the several works on the canal. Their ready payment, with almost unexampled punctuality, has given stability to the credit of the company in the estimation even of those who had at any time questioned the practicability of their undertaking, because of its unprecedented magnitude; of the numerous rival interests it had to conciliate; or of the somewhat contingent and dependent character of the public subscriptions on which it rested.

The accounts of the receipts and disbursements of the company's funds, down to the 30th of May, will be seen in the accompanying documents, and, at the close of them, a balance in the treasury of the company of three hundred and fifty-four thousand seven hundred and seventeen dollars and sixty cents.

Signed in behalf of the President and Directors.

C. F. MERCER,
President of the Ches. and Ohio Canal Co.

Canal Office, *City of Washington, June* 1, 1829.

ABSTRACT of Receipts and Expenditures, and Statement of the Stock and Funds, of the Chesapeake and Ohio Canal Company to the 31st day of May, 1829.

1829.			
May 31	Amount of instalments called for upon subscriptions to the stock of the Chesapeake and Ohio Canal Company, which have been paid to this date, agreeably to the returns received	$520,814 00	
	Amount received, charged to suspense account	180 00	
	Amount received from the Treasurer of the late Potomac Company on account of unclaimed dividends due to sundry stockholders of said company	366 30	
	Amount received on account of tolls Potomac Company	9,945 95	
	Capital stock payable in money, 36,089 shares, at $100	$3,608,900	
	Amount of instalments called for, including 1st payment	541,335	
	Payment received	520,994	
	Balance now in course of collection	$ 20,341	

1829			
May 31	By expenses of commissioners for receiving and superintending subscriptions		$ 275 71
	By balance in hands of commissioners, viz.		19 00
	By contingent expenses of the Chesapeake and Ohio Canal Company		1,855 50
	By amount of requisitions drawn upon the Treasurer, which have been presented and paid, charged to the following appropriations, per vouchers, viz:		
	Pay of President, Directors, and Officers	4,506 14	
	Construction of the canal	121,243 40	
	Engineer Department	15,222 36	
	Contingencies Engineer Department	6,486 78	
	Do western section	1,000 00	
	Printing	1,583 34	
	Stationary	498 82	
	Release and condemnation of land	30,675 49	
	Law expenses	1,883 15	
	Western section	390 60	
	Potomac Company	873 01	
	Postage	75 95	
			184,438 44
	By balance to the credit of the Chesapeake and Ohio Canal Company, in the following banks:		
	Office Bank U. States, Washington	174,139 88	
	Bank of Washington	5,228 49	
	Patriotic Bank	4,799 56	
	Bank of Alexandria	6,264 33	
	Bank of Potomac	15,148 39	
	Farmers' Bank of Alexandria	5,748 53	
	Mechanics' Bank of Alexandria	4,170 05	

ABSTRACT—Continued.

1829. May 31			1829. May 31		
				Farmers' and Mechanics' Bank, Georgetown	40,237 89
				Do do contingent fund -	1,144 50
				Do do unclaimed dividends	366 30
				Do do account of tolls -	9,945 95
				Bank of the Metropolis - - -	984 50
				Hagerstown Bank - - - -	772 48
				Bank of the Valley, Charlestown, Va. -	766 75
				Stock of the State of Maryland - -	75,000 00
					344,717 60
		531,306 25		Dollars	531,306 25

Office of the Treasurer of the Chesapeake and Ohio Canal Company, June 1, 1829.

C. SMITH, *Treasurer.*

Between the 31st day of May and the 1st day of Sept. 1829, requisitions have been drawn upon the Treasurer for $178,850 26, for the following objects:

Construction of canal - - - - - - - - -	$157,340 00
Acquisition of lands - - - - - - - - -	10,862 13
Engineer Department - - - - - - - - -	6,196 54
Western section - - - - - - - - - -	2,400 00
Pay of officers - - - - - - - - - -	1,369 65
Law expenses - - - - - - - - - -	482 68
Potomac company - - - - - - - - - -	101 55
Printing - - - - - - - - - - -	68 28
Postage - - - - - - - - - - -	29 43
Dollars	178,850 26

CANAL OFFICE,
WASHINGTON, *September* 1, 1829.

JOHN P. INGLE,
Clerk of the Chesapeake and Ohio Canal Company.

E.

Plan and estimated cost of the Chesapeake and Ohio canal, prior to its actual commencement in the autumn of 1828.

Extract from the report of the United States' engineer of the 23d of October, 1826, communicated to the House of Representatives with the President's message of the of December, 1826.

"PLAN AND ESTIMATE OF THE CANAL.

"The transverse section of the canal is exhibited on the sheet No. 3. The breadth at the bottom is 33 feet, at surface 48 feet, the depth of water 5 feet; the tow path nine feet wide, the guard banks five feet at the top; the surf berms on the level of water two feet wide each; the tow path and top of the guard bank two feet above the surface of the canal: this transverse section is to be modified where local circumstances require it, and more especially in the cases of deep cutting, steep side cutting, embanking, and also where the canal is supported by walls.

"The depth of five feet has been preserved throughout the line, but the breadth has been often much lessened."

The first 186 miles of this canal, extending from the Market street of Georgetown to Cumberland, the same report estimated, exclusive of contingencies, at $8,177 81.05. Among those contingencies, which embrace engineers' and officers' salaries, fees of counsel, expenses of printing, the cost of land rights has alone been found to exceed 1,000 dollars the mile.

In commenting on this estimate, a committee of the House of Representatives, in a report of the 30th of January, 1827, referring to the proceedings of the Chesapeake and Ohio canal convention, state it to be their opinion, that the eastern section of the Chesapeake and Ohio canal may be extended to the coal banks of the Alleghany, on the enlarged plan recommended by a bill which they report, (with a breadth of sixty feet in easy cutting, and a depth of five feet only) for less than 5,000,000 dollars.

The Central Committee of the Chesapeake and Ohio canal convention, in their report of December, 1826, on this estimate of the United States' engineers, after much reasoning, come to the following result.

"In an estimate, believed, by the committee, to exceed in amount the probable cost of this section of the canal, they have reduced these specific expenditures to 5,000,000 dollars, allowing, as part of that sum, four hundred thousand dollars for unforeseen contingencies."

Instead of the above dimensions, however, the Chesapeake and Ohio canal company have extended the breadth of their canal, at the water line, to 60 feet, at the bottom to 42 feet, and its depth to 6 feet, its tow path to 12 feet in breadth, and its guard bank to eight. They never reduce that depth, and very seldom, and for very short spaces only, the breadth of their canal, in encountering any obstacles. It has, no where above Georgetown, less than the greatest breadth given by the United States' engineers, and much oftener, exceeds sixty feet, than falls short of it. Comparing the two canals, the cross section of the canal recommended by the United States' engineers contains 202.5 square feet; that, of the canal, actually constructed by the Chesapeake and Ohio canal company, 306 square feet: the contents of

a mile of the water prism of the former is 39,600 cubic yards, of the latter 59,840. The contents of the larger, exceed those of the smaller canal, in a ratio of very near 3 to 2: but the calculation of the Central Committee of the convention, having been applied to the smaller of these canals, and having amounted to 4,600,000 dollars, exclusive of contingencies, cannot be considered as deceptive or illusory, if the actual canal, above Georgetown, be constructed, as far as Cumberland, on its present very enlarged plan, for a sum exceeding 5,000,000 of dollars. It is proper, here, to remark that the locks proposed by the United States' engineers were to be 104 feet by 14, in the clear; while those of the Chesapeake and Ohio canal are 100 feet by 15. All the culverts and aqueducts are of solid masonry, laid in hydraulic lime; and the locks are so constructed, by lengthening the side culverts, and multiplying their outlets, as to be passed, it is believed, in less than half the time computed by the United States' engineers.

In the revision, founded on actual survey by Messrs. Geddes and Roberts, civil engineers in the service of the United States, of the above estimate of the eastern section of this canal, they computed the cost of the 186 miles above the entrance of Georgetown at $4,479,346 93. In this estimate they allow for contingencies $407,213 35; but they suppose the depth of the canal not to exceed five feet below the water line, and its breadth, for sixty miles of the 186, to be reduced to 40 feet only; and they provide, in that estimate, for aqueducts with wooden trunks, where the United States' engineers, as well as the actual contracts for this canal, require structures of cut stone laid in hydraulic lime.

These explanations are designed to remove the unfounded impression, that the present estimate of the cost of the Chesapeake and Ohio canal varies, essentially, from that, on which, the former subscriptions to its stock were grounded. Nor is it at all more difficult to reconcile to the present estimate, the actual cost of this canal, so far as it has progressed.

It is conceded that the construction of the 60 miles next above Georgetown will average $30,000, probably $33,000, the mile; but it is still believed that the entire cost of the eastern section, exclusive of the work *in Georgetown*, will not much, if at all, exceed $5,000,000—the former estimate, as has been seen, of the Central Committee.

To reimburse the expenditure in that town, reliance is had on the sale of the mole constructed at the mouth of Rock creek, which is in length 1,057 feet, and in breadth 160 feet; affording the necessary ground for a range of warehouses, eighty feet deep; fronting, at one end, a wharf of forty feet breadth, along the basin in which the canal boats will lie; and, at the other end, another wharf as spacious, along the river, where ships of heavy burthen may securely float in twenty feet water.

In the estimate which carries the cost of the 60 miles of canal between Georgetown and Harper's Ferry to $1,800,000, possibly $2,000,000, the twelve miles beween the Point of Rocks and Harper's Ferry are computed at 250,000, or about 20,000 dollars a mile, after allowing 10,000 dollars for the feeder and dam across the river, immediately below the mouth of the Shenandoah.

This sum exceeds, in the aggregate, the estimate of the cost of this work, made, pursuant to an order of the President and Directors, by a resident engineer of the company, preparatory to placing this part of the canal under contract, and after the acquisition of much experience in the construction of the works below the Point of Rocks.

The river is much narrower, above, than below that point. The dam, for example, at Seneca, measures 2,500 feet in length; that immediately below the Shenandoah will be but 750 feet; and the dam near Williamsport, forty miles higher up, will be but 500 feet long.

All the aqueducts above Harper's Ferry will, probably, not exceed in cost, the two already placed under contract; and it is by no means certain, that the 43 lift locks above the Shenandoah, supplied, as they will be, with the necessary materials from convenient distances, will much exceed in cost, if at all, the 30 locks below it; therefore, 3,000,000 of dollars, or, at the utmost, 25,000 a mile, will, it is believed, prove an adequate sum for the completion of the 126miles of canal, above Harper's Ferry, on the enlarged plan adopted for the canal below; and $150,000 of the $3,000,000 will be applicable to contingencies.

A part of the excess of this sum, above that, which the present capital of the company may be expected to supply for this part of the canal, will be derived, it is hoped, from the subscription of the commonwealth of Virginia; part of the residue might, with advantage to the company and to the public, be drawn, without any invasion or disparagement of private rights, from the application, at suitable points, of the surplus water of the canal, to manufacturing purposes. The inconsiderable, if any, sum, that may still be needed, might be obtained, with facility, either from loans, or renewed appeals to those local interests involved in the ultimate success of this great work.

In the earlier proceedings of the friends of this great national enterprise, in that convention which assembled in Washington on the 6th of November, 1823, when it was contemplated to construct a canal not exceeding in dimensions the Erie canal of New York, the cross section of which is but 136 feet, the estimate of the cost of the part of the eastern section of the Chesapeake and Ohio canal above the old locks, at the Little Falls of Potomac, was estimated at 2,750,000 dollars, and expected to be raised by subscriptions of stock in the proportion of $1,000,000 by the United States, 750,000 dollars by the State of Virginia, 500,000 by the State of Maryland, and 500,000 by the three cities of the District of Columbia. Except the still expected subscription of Virginia, these sums have been already subscribed: the subscriptions of the District corporations have been trebled, and 610,000 dollars added, by the subscriptions of private citizens.

[For F and G, see D.]

H and I.

In Camp, Alleghany Mountain,

10*th May*, 1829.

Dear Sir: We reached the ground destined to be the seat of our first operations on the 2d instant, (Saturday) and commenced our levels on Monday; assuming low water mark at the mouth of Flaugherty creek to be 30 feet below our summit level, which level we met with after having proceeded

up its valley 47 chains, where I made a permanent bench mark, which served as a base for our subsequent movements. Mr. Roberts not being present, nor having yet arrived, I conceived the only proper mode to obtain the object of our inquiry was to run a line of levels on the two opposite sides of the mountain, and to make an accurate traverse of the whole. Under these impressions, I directed one party to carry a line, upon this level, down the valley of Casselman's river, to ascend all the valleys of the mountain as high as this level would lead. In prosecuting these instructions, in two miles, they met with the valley of Blue Lick creek, which they ascended about 1½ miles from its mouth, before the level came in contact with the stream; they, in three miles further, met with the valley of Buffalo run, which they ascended about two miles, when the level was encountered by the stream. There were several small indentations in the side of the mountain, but these two are the most marked, and are the only ones that we can reasonably expect to assist the object of our research.

Another party, I directed to carry the level across the mountain, (up the valley of Flaugherty creek,) and pursue a similar examination on the eastern side. After this party had ascended the valley of Flaugherty creek a short distance, I directed them to pursue a course that carried them directly to Bowman's creek, where it forms its junction with Will's creek, and which had been designated as the eastern entrance to the tunnel. In the accomplishment of this duty, they ascertained that the water in the race of Bowman's sawmill was 18-100ths of a foot below bottom, and the summit of the ridge 875 feet above it. Length of the tunnel somewhat more than four miles.

I directed a third party to run up Casselman's river, to ascertain a point whence a feeder could be taken from that stream, and carry the level over the ground, with a view to the location of a feeder, as they progressed. The result was, that the level struck the river a short distance below Forney's mill-dam.

In all these experimental surveys, I directed the assistants to make bench marks at every half mile, and mark the distance from the junction bench; and, in order that the line might be afterwards followed and examined, to cause the trees in line to be blazed. With regard to the party selected to cross the mountain, they were directed to make bench marks at every elevation of 100 feet.

The first party spoken of have accomplished the line of levels to Buffalo creek, (beyond which any further examination for a tunnel would be useless,) and are running a level from the valley of Blue Lick creek to the mouth of Bowman's, to enable us to institute a comparison between the merits of the two routes. As the formation of the country developes itself to our understanding, we will be better able to determine what other points merit particular examination.

The elevation of the mountain at its summit, where we crossed it, is 875 feet above the level of the tunnel; whereas it is (per report of the U. S. engineers,) 856, making a difference of 19 feet, supposing the two levels of the tunnel to be the same. The reason of this variation is accounted for, when I mention that the levels, as a matter of convenience to the officers of the United States, were carried over the mountain on the road leading to Cumberland, where the mountain has a depression of apparently that number of feet, but in a direction varying from the true course of the tunnel 35 or 40°.

They obtained the true course and distance by calculation. The line run by us was made subservient to the double purpose of taking our level to the valley of Will's creek, and of exhibiting an accurate profile of the tunnel.

The second party spoken of are engaged in running the level on the eastern side of the mountain. The third party, which I entrusted to Mr. De Witt, I have dissolved, and taken its ingredients to strengthen the other two bodies; reserving some, to make the protraction and maps of what has been done, and what is doing.

As to the opinion I have formed of the resources of water for the supply of the summit level, and six miles down on each side of it, it must necessarily be crude, and without any other data than the mere appearance of the streams. and natural situation of the country. As to Casselman's river, it is a fine stream, from 80 to 100 feet wide, 2 to 4 feet deep, running with a steady current of 2 to 3 miles per hour. Flaugherty is much less, but more equal in its discharge; at present, it has enough for two sawmills and a gristmill, with two run of stones, which could be kept in constant operation. Blue Lick is about the same as this last; Buffalo run considerably larger. These three streams taking their rise in the mountains, are supplied principally by springs, and are consequently not much affected by droughts. In addition to these, Elk Lick, flowing into Casselman's river between Flaugherty and Blue Lick creeks, but from the opposite side of the river, might either be carried into the reservoir at Forney's mill, or directly into the canal, by an aqueduct across Casselman. These four streams have not been enumerated in the report of the United States' engineers, nor have they alluded to the extensive reservoirs that can be formed upon them, particularly on Flaugherty. But these are subjects of after consideration, and are merely mentioned to support the opinion I entertain, that there is an abundance of water, if all available means of supply are resorted to, of running water and reservoirs. As to reservoirs, the country strikes me as being peculiarly adapted to their formation. Should these resources, in the course of many years, prove insufficient, let the age when this occurs avail itself of the waters of Deep creek, which can be made to contribute, but which, at present, are not required. The expense of their introduction ought not for a moment impede the progress of a work, so important in the results to be derived from it, as the one now under consideration. But I have full confidence that it can be dispensed with for many years, if ever required.

The climate, I think, is remarkably humid, and that opinion is farther strengthened by the luxuriant growth of the moss, which covers even the fencing on the high grounds. The situation of the country renders showers and falls of rain very common in the summer season, which would all be caught and retained in the reservoirs.

ALFRED CRUGER.

BENJ. WRIGHT, Esq.

Chief Engineer Ches. and Ohio Canal.

Western Section of the Chesapeake and Ohio Canal Tunnel Line,

Brother's Valley Township,

Somerset County, Pennsylvania.

In pursuance of instructions, I beg leave to make the following communications, through the engineer in chief, to the President and Directors of the Chesapeake and Ohio Canal Company.

The party of engineers appointed to this service commenced operations the 4th of the present month, (May,) at the western end of the tunnel or summit line, on Flaugherty creek, at a bench mark (as near as could be ascertained) placed by Capt. McNeill, of the United States topographical engineers. This level was carried up the valley of Casselman's river, to a point opposite Forney's mills, six miles and six chains, to ascertain the line of the feeder; which may be reduced in length to about four miles. This line is mostly over improved bottom and sloping land, quite feasible in quality.

A second party carried the same level down the valley of Casselman, following up the valley of Blue Lick creek, and other streams and indentations of the hills, to a point some distance up the valley of Buffalo creek, in order to ascertain the comparative practicability of different routes for the tunnel line across the Alleghany ridge to Will's creek: and, at the same time, a third party commenced at the proposed mouth of the tunnel on Flaugherty, and carried the line across the Alleghany ridge to the valley of Will's creek, near the mouth of Bowman's run—the same route which was run by the United States engineers. This line of tunnel was found to be four miles long, with a short distance of deep cutting at each end; and the greatest elevation of the ridge was found to be 876 feet above the bottom of the tunnel.

These lines being accurately surveyed and protracted, it appeared from the map that a tunnel line from the valley of Blue Lick creek, across the ridge, to Bowman's or Will's creek, would be at least, as favorable, as the line up Flaugherty; and, as the western end of this line was about three and a half miles further down on Casselman, about that distance of canal would be saved, and the line be made more at right angles across the main ridge. With these impressions, this line was run, and the length of tunnel was found to be 3 miles 4,752 feet, and the greatest elevation of the ridge 955 feet. But the whole amount of elevation on this line is ascertained to be considerably less than on the Flaugherty line. To demonstrate this, a profile of the ridge over each tunnel line has been drawn, and divided into spaces for shafts, 220 yards apart, or 8 shafts to a mile. From this, it appears that the length of the shafts on the Flaugherty line amounts to 13,877 feet, and the length of the shafts on the Blue Lick line amounts to 13,081 feet, making 796 feet of shafts in favor of the Blue Lick line. But as the levels were going on, it is proper to observe that the level of the tunnel penetrated some distance up the valley of Buffalo creek; and, observing the favorable direction of the line, and the depression of the ridges in the direction from Buffalo towards Will's creek or the valley of Brush run, a branch of Will's creek that comes in from the northwest, below Bowman's, with these impressions, the summit level was extended from Bowman's, six miles, to the valley of Brush creek; but those routes being protracted, were found to be more than six miles long, and were therefore abandoned.

The Alleghany ridge, through which the proposed tunnel is to pass, is generally covered with a good growth of different kinds of timber: the oak and chesnut predominate; black cherry, poplar, and pine, abound in some places. The soil is sandy loam or clay, in some parts, of a red color; considerable quantities of loose stone, of the sandstone or freestone kind, abound on the surface; in a few places, the sand rock appears in ledges and cliffs. The interior of the mountain, from all appearances, is soft sand rock. And as bituminous coal is found in many places in this vicinity, the various depths of the shafts would probably pass through many veins of that valuable mineral. The streams of water are very pure, and the climate remarkably healthful; the country is well cultivated and productive in the valleys, and on the sides, and in many places on the tops, of the lower mountains.

A map of the country thus explored, and a profile of the tunnels, with the depth or length of the shafts, are herewith presented. And, as no other route appears so practicable, in this direction, as those above mentioned, I have, for reasons above stated, made choice of the Blue Lick line. And, from the view I have taken of the streams of water, and the surface of the country from which they are to receive their supply, and having carefully examined the reports of the United States' engineers on that subject, and compared those calculations with present appearances, I am fully of opinion that the supply of water for this summit, on the present level, and for eight or ten miles at each end, will be amply sufficient.

But an important view of this subject will be seen by observing the profile of the Blue Lick route—that, if the summit level could be raised and supplied with water at an elevation of 250 feet above the present summit level, the length of the tunnel might be reduced to less than two miles, but the supply of water in that case might be rendered extremely doubtful. At this season of the year, it would not afford much satisfaction to gauge the streams. An opinion, therefore, is all that is submitted at this time.

Being satisfied there would be a sufficient supply of water on the present level, I have deferred, for the present, the examinations for a rail road, and shall comply with those parts of my instructions which require the canal to be located from the east end of the tunnel to Cumberland, and from the west end of the tunnel to the mouth of Casselman, or to Turkeyfoot. These surveys are already commenced, and will be continued with all reasonable despatch. Mr. Cruger will proceed with a party down Casselman, and I shall proceed with a party down Will's creek, and shall occasionally be with each party.

With respect to the estimates of expense of constructing the tunnel, it will require great deliberation and reflection to fix the size and dimensions of the tunnel, towingpath, shafts, headings, drains, &c., which I should choose to submit for further consideration.

The estimates of the canals to be located, together with the locks, aqueducts, culverts, and waste weirs, &c. will be made according to my instructions; although it may be doubtful whether the locations and estimates can be completed from Cumberland to Turkeyfoot much before the first of July.

Any further communications from the Board, or from the engineer in chief, will be most conveniently received at the post office in Cumberland.

All which is respectfully submitted.

NATHAN S. ROBERTS,

Civil Engineer, and Member of the Board of Engineers of the Chesapeake and Ohio Canal Company.

May 16, 1829.

Camp, 14 miles down Will's Creek, Southampton township, Somerset County, Pennsylvania, 31st May, 1829.

To the Engineer in Chief of the Chesapeake and Ohio canal, and through him to the President and Directors of said company, the following communications and statements are respectfully submitted:

Since my communication dated the 16th instant, the location of the Chesapeake and Ohio canal has been progressing, as therein mentioned.

On Will's creek, fourteen miles have been located; but although the greatest diligence has been used by the party, little more than one mile a day has been accomplished: this brings the location within two miles of Little Will's creek. The fall in this distance has been very great, and nearly uniform. The general direction of Will's creek is east, in its passage from Bowman's, and is nearly at right angles from the Alleghany, and across the other great ranges of mountains, through which, nature has formed its channel, for about sixteen miles, to the pleasant valley of Little Will's creek. The whole of the above distance, except in two places, making together about one mile, is a continued forest of various kinds of valuable timber, intermixed with a thick growth of laurel, which is the most tedious of all shrubbery to run a line through. The table lands and glades adjacent, in some directions, are well cultivated old settlements. The ground to be occupied for making the canal is on the narrow bottom in the valley of Will's creek, and along the foot of variously uneven slopes of the hills; the soil is in general very good, though a considerable mixture of loose stone, and in some instances rock, is to be met with; a considerable amount of walling, in places, especially towards the lower end, will be necessary. But what renders this distance, so peculiarly expensive, is the great amount of lockage: we have in 14 miles 860 feet of lockage, and expect 150 feet more in the remaining two miles, to the junction with Little Will's creek.

In the distribution of locks, I have thought proper to locate the first 140 feet in locks of five feet lift, in order to reduce the necessary draft of water through the tunnel; after leaving the tunnel basin, the canal and locks occupy the valley, and command, at short distances, the water, which accumulates very fast in the channel of Will's creek, (a small mill stream at Bowman's.) In about two and a half miles, the accumulation of water was judged sufficient to increase the lift of the locks to 8 feet, which was continued.

Although the valley of Will's creek is narrow, (from 10 to 40 perches,) yet its course is composed of a variety of easy curves through the mountains; but the stream of Will's creek meanders over the valley from side to side; and in locating the line of the canal, the stream has been crossed a number of times, to give a better direction to the canal, and for the greater economy of water. By thus taking in the creek as a feeder, the leakage from the canal and the springs from the hills, which are constantly accumulating, are collected in the channel of the creek, and returned to the canal at short distances, to supply the leakage and evaporation, which are nearly the whole expenditure, as the leakage and soakage are nearly all returned to the canal at each dam. And the surplus, being passed over a suitable waste, into the natural channel, of the creek, is, with its accumulation, again taken for the use of the canal, at the next dam.

As there are so many locks as to render it expensive to convey the feeding water safely around each: the natural channel is made to answer this pur-

pose, and to return the necessary supply, to the canal, at convenient distances.

Besides, the direction of the canal is much improved, being straighter, and placed on ground where it is much easier made, than if it occupied the bed of the stream, (which it must do if the line did not cross it) at the foot of Steep Hills, where the embankment must be secured, by slope walls more or less extensive, against the violence of the stream, which must be forced into a new channel, along the outside of the banks. In one or two instances, the channel of the creek may be used for the canal for short distances: but it is generally passed directly over a stone dam, with a suitable waste-weir. Will's creek, at this season, is a handsome sized mill stream; and Little Will's creek adds about one fourth to its size: although they both diminish considerably during a long drought, yet I am of opinion that a canal, with its fixtures, well constructed, on the above arrangement, would always have a competent supply of water.

The average cost, as estimated, will amount to about $80,000 per mile, as far as the location extends, and to the junction of Little Will's creek.

From the junction of Will's creek and Little Will's creek, (in the pleasant valley formed between the Will's mountain on the east, and Little Alleghany on the west,) the distance to Cumberland is about 14 miles: the sides of the hills abound with lime stone, sand stone, and stone coal, in places, and most of the bottom land is cultivated. Through this distance, the canal can be constructed at less than half the expense of the part above the junction, as the lockage is only about one third as great, and the other difficulties proportionably less.

If we have suitable weather, I am of opinion we shall arrive at the bench mark made by Geddes and Roberts, below Cumberland, in about ten days.

All which is respectfully submitted,

NATHAN S. ROBERTS, *Engineer,*

And Member of the Board of Engineers of the Chesapeake and Ohio Canal.

The following further Reports and Estimates have been received since the meeting in June.

5 miles below Connellsville, on the right bank of the Youghiogany River.

CAMP, EAST LIBERTY, 23d JUNE, 1829,

Fayette County, Pennsylvania.

To the Engineer in Chief of the Chesapeake and Ohio Canal:

SIR: After separating into two parties on the summit, the charge of the western location, to Turkeyfoot, was committed to Mr. Alfred Cruger, Assistant Engineer, appointed by the Board. The situation of the two divisions from each other, and the necessary attention to that under my more

immediate care, (the Will's creek division) made it inconvenient for me to attend on the western or Casselman division, except a few miles at each end; but, having attentively examined the estimates and a part of the location, am of opinion the same are correct and judicious. I would remark, with regard to the location of a dam about 300 yards below Turkeyfoot, or the junction of Casselman, the Youghiogany, and the North branch or Laurel run, that a spacious and highly useful basin would be formed in the mouths of those streams, which would flow up the Youghiogany nearly one mile, *in a direction towards Smithfield, situated about three miles south on the national road. This would greatly accommodate that town and the surrounding country, by affording a constant supply of surplus water for various mechanical operations.* The canal might be connected with the basin, by locking into the mouth of Laurel run, or by an aqueduct over said river, and about 30 chains of canal, and communicate with said basin by a guard lock, as reported, &c. This dam would be about 8 feet high and 400 feet long.

Respectfully submitted.

NATHAN S. ROBERTS,
Member of the Board of Engineers, Chesapeake and Ohio Canal.

Sir: I would further observe that the parties are now on the remainder of the western section, and will this day commence the location. The party with Mr. Cruger will commence at Connellsville, and the other at Sewickly creek, about twenty-eight miles below. The maps of the Will's creek division are left in care of Mr. Shriver, at Cumberland, and will be soon forwarded by him to the Board, or, at farthest, by Mr. A. Stewart, who will probably attend the next meeting of the Board. The maps and profiles of the Casselman survey will probably be sent by the same conveyance.

Yours, respectfully,
NATHAN S. ROBERTS, *Engineer, &c.*

The Engineer in Chief, &c. &c.

Remarks upon the termination of the Canal at Pittsburg, August 10, 1829.

To the President of the Board of Directors of the Chesapeake and Ohio Canal Company:

Sir: Having completed the location of the western section of the Chesapeake and Ohio canal, by connecting it with the tunnel level of the Pennsylvania canal in the city of Pittsburg, agreeably to my letter of instructions, yet, for reasons respecting the economy of said termination, I take the liberty to offer a few of my own observations thereon for consideration.

It will be noticed in the estimates, that, from the Two Mile run to the proposed termination, the construction of the canal will be extremely difficult and expensive, as the canal for the whole distance will have to be made along the face of a very steep side hill, principally composed of clay of the same character of those hills up the Alleghany river, which have so often slipped and filled up the Pennsylvania canal, both while it was constructing and since it has been completed. And to these considerations of expense must be added the probably large amount of private damages to be appraised to individuals for the number of buildings to be moved, and the expense of opening new streets and roads, and for the damages done to gardens and lots of ground necessary to be occupied by the canal in approaching the present termination, (as above mentioned,) in order to descend through their locks into the Monongahela or the Ohio river. The lockage to be saved by this connexion is thirty-seven feet, divided into four locks, which are nearly completed: and I take the liberty to notice that the locks on that canal are but ninety feet in the chamber, being ten feet shorter than those on the Chesapeake and Ohio canal.

Should the above location and termination of the canal be ascertained to be unusually expensive and inconvenient, for the reasons above stated, the same can be avoided by shortening the canal about one and three quarter miles, and locking into the Monongahela above this clay bank, just below the mouth of the Two Mile run, where a very favorable situation for all the purposes presents for the termination of the canal.

By this termination, not only the above expense will be avoided, but an improved location of the canal and locks can be made, by commencing about three miles up the river, at the lower end of the Scotch Bottoms, whereby a great saving will be made in crossing the Four Mile run, and by leaving the public road undisturbed, and saving much expense in steep side hill cutting and deep embankments; for the line of the canal thus revised would run below the road, and along the bottoms, quite to the proposed place of termination at the Two Mile run.

I am fully of opinion that, by this arrangement, a saving would be made in the expense of constructing *these three miles* of canal, sufficient to construct thirty-seven feet of lockage saved on the first termination, anew, and of the same length of those required and now building on the Chesapeake and Ohio canal, and in favor of terminating at the Two Mile run, if it should be thought in other respects expedient. It is proper to observe that the Monongahela river from thence to Pittsburg is a most beautiful sheet of water, with but very little fall or current, which is scarcely perceptible. Its width at low water is about fourteen hundred feet, and its depth, at the same time, from six to eight feet: its rise in time of floods is from fifteen to thirty feet, but, being confined between high banks on each side, its width in time of floods is not materially increased, as below the Two Mile run it seldom rises to the top of its banks. From the city up to the Two Mile run, is considered as the suburbs, which along the river is much occupied by manufactories of different kinds; and above the steep bank the ground is highly improved, as gardens, orchards, meadows, &c. interpersed with numerous buildings, many of which are tasteful and elegant. On the opposite side of the Monongahela is situated the manufacturing town of Birmingham; and many other large manufacturing establishments are seen further down the river,

All these places are accommodated by steamboats in their season, and all other river craft; and from the information obtained and my own observation, the great natural harbor for steamboats in the Monongahela extends quite up to the Two Mile run, and is in all respects as capable of improvements as that part of the river which they now occupy before the city of Pittsburg.

All which is very respectfully submitted,

NATHAN S. ROBERTS.
Civil Engineer, &c.

GEORGETOWN, *2d September*, 1829.

To the President of the Board of Directors of the Chesapeake and Ohio Canal Company:

SIR: The summit level of the Chesapeake and Ohio canal, embracing the tunnel through the Alleghany ridge, the deep cuttings, and the basins at each end, and the feeder from the Casselman river, are the subjects of this communication.

All which is respectfully submitted.

NATHAN S. ROBERTS,
Engineer of the Second Division C. & O. Canal.

The Alleghany ridge, through which the tunnel is to be cut, is supposed to be sandstone with a mixture of slate: this opinion being formed from the quality of the rocks which appear on the surface, and in cliffs in the sides of the mountain at various heights. And, in corroboration of this opinion, it is proper to state that the same qualities of stone present themselves both above and below the level of the tunnel, along the line of the canal, in detached boulders and large masses, variously disposed in the bed and on the margin of the rivers, and in the *debris* or fine broken stone, which in many places cover the steep sides of the mountain; and, proceeding west, the regular layers and horizontal cliffs and ledges of sandstone appear in all the steep hills and mountains through which the channel seems to have been worn down by the Casselman and the Youghiogany, till they have united and passed through Laurel hill. And the same quality of sandstone, with veins of slate, appears in horizontal strata above the coal veins, in the high hills in the vicinity of the Monongahela and Pittsburg, and in the coal district near Cumberland. Frostburgh and Westernport sandstone is found in the same situations. In a few places, these stone are of the millstone grit, and wrought for that purpose. This was observed on the national road, and about twelve miles down the valley of Will's creek: but, in general, they are a soft sandstone, suitable for locks and all other purposes where cut stone work is necessary.

The elevation of the tunnel or summit level is 1972 feet above low tides at Georgetown, and 1273 feet above low water in the Ohio at Pittsburg; and the difference shows that the Ohio river at low water at Pittsburg is 699 feet above common low tides at Georgetown.

The length of the summit level consists of the tunnel of 4 miles, to be excavated through the Alleghany ridge, and at each end of the tunnel a deep cut and a basin are extended, and terminated by a lock.

The length of the deep cutting and the basin at the eastern end is 40 chains, and the length of the deep cutting and basin at the west end is 1 mile, making the whole length of the summit level, from lock to lock, 5 miles and 40 chains.

The dimensions of a transverse section of the interior of the tunnel, and upon which the following calculations are presented, are shown in the annexed diagram, and are as follows, viz:

The water for the passage of boats through said tunnel is to be 6 feet deep and 17 feet wide. The towing path to be 7 feet high (rising one foot above water) and 5 feet wide. The width of the tunnel, above the towing path, will be 22 feet, and the height 7 feet to the spring of the arch, which is supposed to be equal to a semicircle of 11 feet radius. On each side of the bottom of the tunnel a drain is to be sunk in the rock, below the bottom of the canal, equal to a cut of 2 feet square, with a descent of 3 feet in the distance from the centre to each end of the tunnel. A section of the tunnel, according to these dimensions, is equal to 52⅓ superficial yards; and the solid contents in 4 miles will be equal to 368,428 cubic yards.

In the prosecution of this work, it is calculated that 120 men, divided into relays of 30 men each, may be advantageously employed at blasting and quarrying at each end of the tunnel; one company to perform 12 hours, and then be relieved by another company, to labor for an equal length of time, and thus proceed through the 24 hours, making, in the result, a force equal to 120 men laboring for 12 hours in each day. And it is computed that, taking a portion of the heading, the side trimmings, and the drain, together with the blasting and quarrying from the breast or body of the tunnel, a good hand will not average less than ¾ of a cubic yard for each day's work. At this rate, 120 men will blast and quarry 90 cubic yards per day.

The tunnel, as above stated, contains 368,428 cubic yards; this quantity, divided by the amount of one day's work, gives 4,094 days; and allowing 300 days for labor in each year, the time required to complete the excavation of the tunnel will be 13 years and 194 days.

The wages, subsistence, and apparatus, furnished and kept in repair, for each man per day, for blasting and quarrying in the tunnel, is computed as follows:

Wages per day, on an average, - - - -	$1 00
Board and other necessaries of subsistence per day, -	50
Gunpowder, all necessary tools, and light, per day, -	75
Making the average expense of a day's work of one man,	$2 25

Then, a day's work of 120 men, at the above rate, will be $270, and the amount of rock quarried in the same time being 90 cubic yards, the average cost will be $3 per cubic yard.

The expense of transporting the excavated materials out of the tunnel is computed as follows: A rail-road with two sets of tracts is to be laid on and bolted to the bottom of the tunnel, as the work progresses, and to extend past the deep cutting and basin at each end of the tunnel, for the purpose of

conveying the materials to a place of deposite and distribution. The expense of a double rail road equal to the whole length of the tunnel, and half a mile at each end, for the above purposes, is estimated at follows, viz:

5 miles of double tracks will require 105,600 feet of timber, 8 by 12 inches square, and from 20 to 40 feet long, for side rails, delivered at 8 cents per foot, - - -	$8,448
10,560 inch bolts, 16 inches long, equal to 23 tons, at 150 dollars, - - - - - - - -	3,450
105,600 feet of rolled iron plates, 1¼ inches wide and ⅜ths of an inch thick, equal to 106 tons, at 130 dollars per ton, -	13,780
1 ton of spikes, - - - - - -	200
Fitting down and bolting the side rails to the rock, and spiking on the plates on the inner edge of each set of tracks in a workmanlike manner, and completing the same fit for use, (the bolts being ready made, and the plates punched at the above prices,) 6,400 rods of the road, laid as above stated, at 50 cents a rod, - - - - - -	3,200
Making the whole expense of the rail road - -	$29,070

The materials excavated from the tunnel are to be transported on this rail-road, being laid for the purpose, from each end towards the centre, as the excavation of the tunnel progresses.

The load which a horse will draw on such a rail-road, and moving at the rate of 2½ miles per hour, is stated variously by different authors, and varies from 8 to 11 tons. But, in these calculations, 1 ton only is estimated for each load, on an average, to be drawn by one horse. The day's work of a man and team is computed at ten hours each day, moving at the rate of 2½ miles per hour, including the time of loading and unloading—making 25 miles for every period of 12 hours.

The cost of a day's work of a man and team is estimated at	$2 00
One assistant loader to each wagon, to have the loads ready, &c.	1 00
Making the cost of 1 team and 1 loader, per day, equal to	$3 00

Supposing the materials to be taken from the tunnel to be sand rock and slate, the comparative weight or specific gravity of which is estimated at 2.8, then the weight of the contents of the tunnel to be transported will be equal to 388,576 tons, to be taken out at each end of the tunnel, at 1 ton per load, or 777,152 tons in the whole 4 miles.

The distance to be travelled out and in at each end of the tunnel is thus stated: at the commencement the distance would be, on an average, 40 chains out and 40 chains back, and, at the centre of the tunnel, the distance would be 2 miles and 40 chains out, and the same distance back, and the number of times the average of these distances is to be travelled is equal to the number of tons to be taken out at each end of the tunnel—thus stated: $\frac{40+40+200+200\times 388,576\div 80}{2}=1,165.720$ miles to be travelled out and in, from each end of the tunnel. This sum divided by 25, the estimated length of a day's travel, gives 46,629.12 day's travel for one team at

each end of the tunnel. But the transportation is to be done in the same time with the excavation; then, $\frac{46.629.12 \times 2}{4.094} = 22.8$ teams per day, in the whole, or 11.4 teams per day at each end of the tunnel, to keep even with the excavation.

As the height of the mountain over the line of the tunnel would render vertical shafts very expensive, it is proposed that, when the excavation of the tunnel has advanced about half a mile at each end, or perhaps sooner, to ventilate the tunnel by means of a steam engine of about ten horse power, to be stationed one at each end of the tunnel, with the necessary apparatus, to operate upon one or more cast iron blast cylinders, to be attached to a wooden trunk of the capacity of one foot square, made of two-inch plank, well matched, pitched, and banded with iron, so as to be perfectly air-tight, and properly placed and secured on the towing path of the tunnel, and to be extended by additions, from time to time, as may be required. Through this tube a sufficient quantity of air is to be forced, by the above apparatus, to ventilate the tunnel to its centre.

By a statement received from Mr. John Anthers, steam engine manufacturer at Pittsburg, the cost of a first rate steam engine at that place, of 10 horse power, is		$ 1,200
One large air cylinder and apparatus		500
Transporting the same to the tunnel, and putting the whole in good order fit for use		300
A wooden trunk of the description above stated, and being extended by degrees to the centre of the tunnel, 10,560 feet, at 50 cents a foot		5,280
The expense of fuel, Mr. Anthers states, for 24 hours is "25 bushels of coal," estimated at 8 cents, or "2 cords of good wood," estimated at $ 1,	2 00	
Cost of attendant and keeping in repair	2 50	
Making the whole cost for 24 hours	$4 50	
This expense would be necessary about 10 years, then $10 \times 300 =$ 3,000 days, at $ 4 50 per day		13,500
Add for contingencies 20 per cent.		4,220
Making the whole cost of ventilating one end of the tunnel, for the required time, amount to		$25,000

Mr. Anthers states further, that such an engine, with but very little repairing, will last 10 years in constant use.

It is proper to observe that bituminous coal of the best quality can be obtained within 5 or 6 miles of the west end of the tunnel, and that timber for fuel abounds more at the east end, where coal is not to be expected so cheap, but perhaps it can be obtained at the above estimated price, or found in excavating the tunnel.

Whether the tunnel or any part of the interior will require a lining of masonry is uncertain. If the excavation should be sound rock in regular strata, no lining will be necessary, except perhaps at the ends, to give a finish, and prevent the earth from falling into the mouth of the tunnel. The cost of lining, more or less, is not included; and it is proper to observe, that,

where a lining becomes necessary, the section of excavation should be so enlarged as to preserve the same dimensions within the lining as are herein expressed.

From the foregoing calculation and analysis of prices, the estimated cost of the tunnel will stand as follows, viz:

Excavating 368,428 cubic yards of rock, at $3	$1,105,284
Rail road, with double tracks, 5 miles	29,070
Transporting the contents of the tunnel, viz: 22.8 teams, with one teamster and one loader to each team, for 4,094 days, making 93,343 days, at $3	280,029
Ventilating the tunnel, viz: 2 steam engines of 10 horse power, one at each end of the tunnel, with the necessary apparatus for ventilating, including the expense of fuel, attendant, and repairs, for 10 years, at $25,000 each	50,000
Add for contingencies 10 per cent.	146,438
Making the estimated cost of excavation, transportation, and ventilating the tunnel, amount to	$1,610,821

Which is equal to $\frac{\$1,610,821}{yds\ 368,428}$ or $\$4\ 37\frac{3}{10}$ per cubic yard for the whole quantity of materials required to be taken out of the tunnel, according to the dimensions above stated.

The deep cutting and basin at the east end of the tunnel is 40 chains in length; the expense of constructing the same is as follows viz:

Grubbing and cleaning for canal and basin	$1,000
Common excavation, 44,600 yds. at 20 cts., to be laid in the lining for the basin	8,920
Rock excavation, 15,800 yds. at $1	15,800
	25,720
Add for contingencies 10 per cent.	2,572
	$28,292

The deep cutting and basin at the west end of the tunnel occupy 1 mile: the expense of constructing the same is as follows:

Grubbing and clearing, preparatory	$500
Common excavation, 56,320 yds., at 20 cts., to be laid in embankment to form the basin	11,264
Common excavation 74,800 cubic yds. at 15 cts.	11,220
Rock excavation, 44,000 cubic yds., at $1	44,000
	66,984
Add for contingencies 10 per cent.	6,698
	$73,682

The dimensions of the deep cuttings for the canal from each end of the tunnel, are 30 feet at bottom of the canal, and the sides perpendicular through the rock cutting, with the usual slope of 3 to 2 given to the earth excavation.

The basins will be formed by occupying the valley at each end of the tunnel, where the same is below bottom, for depositing the materials taken from the tunnel in the form of an embankment; and lining the same with the excavated earth, to render the banks and bottom of each impervious to water. Each basin is to be formed with a waste-weir and a lock at the extremity. The distance between these locks is 5 miles and 40 chains, including the basins, the deep cutting, and the tunnel, which compose the length of the summit level."—*Rep. of Roberts and Cruger.*

In the able report of the United States' engineers, on the plan and cost of constructing the contemplated tunnel through the Alleghany, they proposed to expedite the progress of the work, and to cheapen its expense, by sinking over the tunnel forty eight working shafts. By each of these, two additional surfaces to operate upon, would be presented to the laborers engaged in the tunnel, who would work day and night without any interruption, except while elevating them to the surface of the mountain and letting them down, to renew their operations at regular intervals. These would, of course, be so ordered, as to allow ample time for refreshment and recreation to the laborer.

A steam engine of ten horse power, costing about $1,200, and placed near the summit of each working shaft, would raise, and transport out of the way, the excavated materials, whether of rock or earth, as fast as the laborers could remove them, within the tunnel, to the bottom of the shaft.

As to the mode of elevating these materials, none would, perhaps, better answer, than an application of the principle, by which the wheat is elevated in a manufacturing flour mill. The empty buckets, on one side of an endless chain of large square links, would balance those on the opposite side, at every stage of the revolution of the drum or cylinder, over which the chain revolves; so that the weight to be elevated would be that, only, of the excavated materials from within the tunnel.

The cost of all the working shafts recommended by the United States' Board of Internal Improvement, is less than three hundred thousand dollars. If reduced in number, to four only, for each mile, their cost would be reduced in like proportion, so as not to exceed one hundred thousand dollars; while the opportunity, thus afforded, of applying sixteen times the number of hands, which could be worked on the two extremes of the tunnel, would proportionably expedite its completion. Instead, therefore, of consuming thirteen years, with such facilities, the same work would be accomplished in less than a fourth of that period.

Tunnels on rail roads, as well as canals, are now so numerous in England, that estimates can be as accurately formed of the money and time required for their construction, as for any other part of a rail road or canal.

On the canals, alone, of that country, there were, in 1824, near forty tunnels, varying in breadth from nine to twenty-one feet; in length, from seventy to 4,840 yards; their aggregate extent being 62,291 yards, exclusive of those numerous subterranean canals for coal boats; of which, on a single canal of the Duke of Bridgewater, there are branches of the extent of eighteen miles on various levels; some sixty yards below the main canal; others thirty-five and a half above it; the greater part of them all being hewed out of solid rocks.

The driving of the tunnel through Harecastle hill, on the Trent and Mersey canal, the first canal tunnel constructed in England, cost, in 1776,

£3 10*s.* 6*d.* sterling, per yard run. On this single canal, in length 93 miles, with a lockage of 642 feet, there are as many as five tunnels; one mile of the longest of them, which is 2.888 yards in extent, was completed in a single year, though the natural surface of the earth was 210 feet above the tunnel.

Messrs. Roberts and Cruger estimate the entire cost of the proposed tunnel through the Alleghany, at 1,610,821 dollars. To reach this sum, they compute the wages and board of the hands, engaged in the excavation, at $1 50 cts. each per day, after allowing 75 cts. more for his gunpowder, tools, and light: the price of a cart, horse, driver, and assistant, working on a rail way, and drawing less than half a cubic yard of the excavated materials at a load, at $3 a day. It is not hazarding much to pronounce these allowances at least one-third too high. Carts are never hired on the Chesapeake and Ohio canal, at more than $1 25 cts. per day, the driver being himself found, but finding his own horse; and 80 cents per day is believed to be an adequate allowance for the wages of each hand, including his board. The subterranean character of the work would prevent the reduction of the working days of the month, by changes of weather, and still farther cheapen the operation. Still, as the breadth calculated for the tunnel, in this estimate, is about 17 feet less than the greatest utility of the work would require, after deducting the third of the computed cost of the excavation and transportation of materials, or 450 000 dollars, for the above reason, and the cost of ventilating the tunnel, in consequence of the introduction of the perpendicular working shafts over it; being, in all, half a million of dollars, so as to reduce the cost of the tunnel described by the above engineers, exclusive of contingencies, to less than one million; the residue may be doubled on account of its increased breadth, and the sinking of the shafts; and the cost of the tunnel put down at 2,200,000 dollars, including all contingencies.

The ratio of the solid contents of the enlarged to the solid contents of the smaller tunnel, it is admitted, would not be in the direct proportion of their relative breadth; but the increased facility of working in an enlarged space, and the reduction of the cost of transportation, effected by the application of the working shafts, would make this estimate sufficiently great to cover the total expense of a tunnel, within which, the canal boats might readily pass each other in opposite directions.

This estimate supposes the tunnel to be conducted through solid rock; and an inner arch of brick or stone to sustain the crown of it, to be unnecessary. Should its passage be through earth, requiring artificial support, the cost of this should be added, but the expense of excavation be reduced, since this necessity supposes the excavation not to be of rock.

SUMMARY

FROM THE

REPORT OF MESSRS. ROBERTS AND CRUGER,

OF THE

SEVERAL SUBDIVISIONS OF THE WESTERN SECTION OF THE CHESAPEAKE AND OHIO CANAL,

EXTENDING FROM

CUMBERLAND, MARYLAND, TO PITTSBURG, PENNSYLVANIA.

SUMMARY from the report of Messrs. Roberts and Cruger, of the Canal, extending from Cumberland,

Number of Sub-division.		Length.		Grubbing, &c.	Excavation.	
		Miles.	Chns.	Cost	Cubic yds.	Cost.
First division. Extending from Cumberland to Turkey-Foot.	Summit level, - -	5	40	$ 4,556	848,048	$1,731,787 50
	No. 1, east, - - From tunnel basin to Little Will's creek.	15	60	11,100	526,799	74,447 37
	No. 2, east, - - From Little Will's creek to Cumberland.	15	7	4,485	406,753	45,976 17
	No. 1, west, - - From the west end of tunnel basin to Middle Fork creek.	14	40	9,141	246,451	38,619 95
	No. 2, west, - - From Middle Fork creek to Turkey-foot.	17	3	10,208	362,820	52,646 97
		67	70	39,490	2,390,871	1,943,477 96
Second division. Extending from Turkey-Foot to Pittsburg.	No. 3, west, - - From Turkey-Foot to Connellsville.	27	00	15,540	1,228,101	269,336 61
	No. 4, west, - - From Connellsville to Sewickly creek.	27	6	11,270	556,243	67,020 97
	No. 5, west, - - From Sewickly creek to McKeesport.	16	52	7,124	488,685	53,245 29
	No. 6, west, - - From McKeesport to Pittsburg.	14	79	9,599	903,968	116,993 48
		85	57	$43,533	3,176,997	$506,596 35

RECAPITULATION OF

First division, - - - Extending from Cumberland to Turkey-Foot, being that part of the line denominated by the U. S. Board of Internal Improvement "the middle section."	67	70	39,490	2,390,871	1,943,477 96
Second division, - - - Extending from Turkey-Foot to Pittsburg, denominated by the United States Board of Internal Improvement "the western section."	85	57	43,533	3,176,997	506,596 35
Totals, -	153	47	$83,023	5,567,868	$2,450,074 31

several subdivisions of the western section of the Chesapeake and Ohio Maryland, to Pittsburg, Pennsylvania.

Embankment.		Slope walls.		Culverts		Aqueducts.		Dams and feeders.	
Cubic yds.	Cost.	Perches.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.
169,280	$ 11,064 00	11,064	$ 11,064 00	9	$ 2,950		-	2	$56,200
288,902	55,695 16	35,412	31,236 00		-		-	23	16,750
288,128	44,341 21	13,794	12,899 00	10	3,400		-	6	20,775
579,757	83,614 11	48,237	47,908 60	14	7,035	1	$6,500	3	4,825
539,355	87,862 91	41,749	40,282 65	9	3,500	1	12,900	2	13,077
1,865,422	282,577 39	150,256	143,390 25	42	16,885	2	19,400	36	111,627
727,702	152,864 56	88,768	69,057 50	15	4,900	1	10,000	2	4,760
1,708,616	312,380 48	134,358	137,311 50	56	21,567	1	17,014	2	21,800
1,176,980	232,186 97	55,707.6	60,947 85	49	19,114				
830,659	126,459 35	-	- -	28	22,306				
4,443,957	$823,891 36	278,833.6	$267,316 85	148	$67,887	2	$17,014	4	$26,560

THE WESTERN SECTION.

1,865,422	282,577 39	150,256	143,390 25	42	16,885	2	19,400	36	111,627
4,443,957	823,891 36	278,833.6	267,316 8	148	67,887	2	17,014	4	26,560
6,309,389	$1,106,468 75	429,089.6	$410,707 10	190	$84,772	4	36,414	40	$138,187

SUMMARY—

	Number of Sub-division.	Bridges. No.	Bridges. Cost.	Wasteweirs. No	Wasteweirs. Cost.	Locks. No.	Locks. Lift.	Locks. Cost
First division. Extending from Cumberland to Turkey-Foot.	Summit level, -	13	$1,750	-	-	-	-	-
	No. 1, east, - - From tunnel basin to Little Will's creek.	23	2,125	23		139	1,028	$1,028,000
	No. 2, east, - - From Little Will's creek to Cumberland.	18	2,890	6		39	309	309,000
	No. 1, west, - - From the west end of tunnel basin to Middle Fork creek.	7	950	9	$1,405	28	224	224,000
	No. 2, west, - - From Middle Fork Turkey-Foot.	12	1,600	3	375	54	434	434,000
		73	9,315	41	1,780	260	1,995	1,995,000
Second division. Extending from Turkey-Foot to Pittsburg.	No. 3, west, - - From Turkey-Foot to Connellsville.	5	850	5	1,000	54	432	345,000
	No. 4, west, - - From Connellsville to Sewickly creek.	20	1,350	9	1,355	16	126.83	126,830
	No. 5, west, - - From Sewickly creek to McKeesport.	18	2,675		-	1	8	8,000
	No. 6, west, - - From McKeesport to Pittsburg.	23	3,395		-	2	11.50	11,500
		66	$8,270	14	$2,355	73	578.33	491,330

RECAPITULATION OF

First division, - - Extending from Cumberland to Turkey-Foot, being that part of the line denominated by the U. S. Board of Internal Improvement "the middle section."	73	9,315	41	1,780	260	1,995	1,995,000
Second division, - Extending from Turkey-Foot to Pittsburg, denominated by the United States Board of Internal Improvement "the western section."	66	8,270	14	2,355	73	578.33	491,330
Totals, -	139	$17,585	55	$4,135	333	2,573.33	2,486,330

Continued.

Total cost of a 40 feet Canal, 4 feet deep.		Total cost of a 48 feet Canal, 5 feet deep.		Total cost of a 60 feet Canal, 6 feet deep.	
Cost of Sub-div.	Av. cost p. ml.	Cost of Sub-div.	Av. cost p. ml.	Cost of Sub-div.	A. cost p. ml.
$1,856,056	$99,968	$1,856,056	$99,968	$1,856,056	$99,968
1,341,288	83,830	1,370,618	85,663	1,489,218	93,076
488,143	32,354	515,553	34,170	560,983	37,181
466,398	32,165	503,042	35,382	528,425	36,443
722,097	42,382	773,216	45,383	811,379	47,623
4,873,982	71,808	5,018,485	73,940	5,246,061	77,290
963,939	35,701	1,067,284	39,529	1,083,979	40,147
781,497	28,864	840,607	31,046	876,681	32,379
421,622	25,322	454,877	27,320	473,218	28,421
321,650	21,463	351,408	23,380	368,734	24,602
$2,488,708	-	$2,714,176	-	$2,802,612	

THE WESTERN SECTION—Continued.

4,873,982	71,808	5,018,485	73,940	5,246,061	77,290
2,488,708	29,035	2,714,176	31,666	2,802,602	32,697
$7,362,690	47,939	7,732,661	50,347	8,048,673	52,404

SUMMARY—Continued.

CONDENSED ESTIMATE OF THE COST OF THE WHOLE LINE FROM GEORGETOWN TO PITTSBURG.

	Miles.	Chains.	Forty feet.	Average per mile.	Forty-eight feet.	Average per mile.	Sixty feet.	Average per mile.
EASTERN SECTION, as estimated by Geddes and Roberts, in 1827	186	61	$4,008,005	$21,301	$4,330,991	$23,239	$4,479,346	$23,980
WESTERN SECTION, as per foregoing estimates	153	47	7,362,690	47,938	7,732,661	50,347	8,048,673	52,404
	340	28	11,370,695	83,409	12,063,652	35,444	12,528,019	36,809

K.

A letter from certain members of the House of Representatives to the President of the United States.

SIR: The undersigned members of the House of Representatives, duly impressed with the importance of uniting, by the closest ties of intercourse, those portions of the United States which are at present divided by continued chains of lofty mountains, and especially the extensive slopes descending from the Alleghany, westwardly, towards the Mississippi and the Gulf of Mexico, and eastwardly, to the Atlantic; and understanding that, by the existing laws, the soldiers of the regular army may be employed on works of public utility, beg leave to recommend to your consideration the expediency of concentrating near the proposed tunnel, for uniting the waters of the Chesapeake and the Ohio, a portion of the army; and of directing its labor, under the inspection of skilful engineers, first in sinking the necessary air and working shafts for constructing the said tunnel, and, next, in completing the same in the shortest practicable period.

The labor, which these works would require of the troops, bears a peculiar analogy to some of the most difficult, and, in Europe, the most frequent operations of war, while the instruments employed in them are such, as impart additional strength to the arm of the soldier, and render him more formidable to his enemy.

If objections were made to the subterranean character of the labor on the score of health, an answer to them would be found in the unremitting vigor and cheerful alacrity, with which the hands engaged on the coal mines of James river perform their daily tasks, in pits sunk below the level of tide-water. The proposed tunnel, on the contrary, will be rendered, by its great elevation above the adjacent valleys of the Alleghany, both dry and healthful.

A force not exceeding one thousand men, stationed as is here proposed, would greatly accelerate the completion of the tunnel; while its position, during the continuance of its useful labor, would render it as efficient for the public defence, as if it were distributed as at present, where its labor, as the undersigned have been credibly informed, is often misapplied.

The distance from the tunnel to the navigable waters of the Potomac does not exceed thirty-one miles, and from the Monongahela, seventy; while access to both is opened, from Smithfield, by the Cumberland road, at a distance not exceeding forty miles from either.

To supply the troops employed in the service with an incentive to labor with greater alacrity, the undersigned have no doubt, but that, if their recommendation shall accord with the views of the Executive Department, the Congress would increase the compensation now allowed for extra labor; and the more readily, as the motives to desertion, which now thin the ranks of the army, would be diminished by the enhanced compensation of the soldier, the wholesome occupation given him, and the absence of all countervailing temptations to dissipation and excess.

The undersigned are aware that the authority to construct the proposed work has been expressly vested in the Chesapeake and Ohio Canal Company, by their charter; itself a compact between the United States and the States of Virginia, Maryland, and Pennsylvania; but they are well assured that an arrangement might be made with that company, alike beneficial to their in-

terest and the great and useful end which the undersigned have in view, as to the general health and efficiency of the army.

The undersigned are also apprised that doubts exist as to the expediency of crossing the Alleghany, in the proposed route, by a canal or rail-way; and, accordingly, that authority has been granted to the Chesapeake and Ohio Canal Company, by an early amendment of their charter, to effect their passage across this formidable barrier in either mode. The construction of the tunnel, by overcoming a rise and fall of 1,700 feet in the short compass of four miles, would prove, however, alike beneficial to either of these modes of communication between the eastern and western waters.

It is not designed, by a special recommendation of the proposed work on the Alleghany, to limit, in any respect, the Executive discretion, to which, the employment of the troops on useful public enterprises is confided by the laws. The undersigned believe that the efficiency of the army in war, apart from the valuable military use of the works which it may construct, would be promoted by a judicious application of its labor in peace.

We have the honor to be, with great respect, your obedient servants.

John Kincaid,
T. Beekman,
H. R. Storrs,
J. C. Isacks,
John Davis,
S. Pettis,
John Test,
S. A. Smith,
Innis Green,
James Ford,
R. M. Johnson,
A. C. Martindale,
John Blair,
A. H. Sevier,
Thomas Chilton,
P. L. Tracy,
J. Richardson,
James L. Hodges,
John Thomson,
Lewis Maxwell,
George Grennell, jr.
William L. Storrs,
Joseph G. Kendall,
Timothy Childs,
Richard Spencer,
Joseph Duncan,
Robert S. Rose,
Edward B. Dudley,
Lewis Williams,
W. B. Shepard,
Joseph M. White,
Jonathan Hunt,
D. L. Barringer,
Robert Craig,
Duttee J. Pearce,
Edmund Deberry,
Horace Everett,
Richard M. Cooper,
C. F. Mercer,
B. I. Semmes,
Harmar Denny,
John Bailey,
P. Doddridge,
John D. Dickinson,
E. F. Norton,
John Varnum,
Thomas Irwin,
Wm. McCreery,
Thomas H. Sill,
George C. Washington,
John Gilmore,
C. Forward,
J. B. Sutherland,
William Armstrong,
M. C. Sprigg,
D. H. Miller,
R. C. Mallary,
Samuel Swann,
Tristam Burges,
Clement Dorsey,
W. Ramsey,
David Crockett,
Philander Stephens,
Robert P. Letcher,
Elisha Whittlesey,
Lewis Condict,

James Clark,
Joseph H. Crane,
Isaac Pierson,
M. Bartley,
H. B. Cowles,
H. Daniel,
Thomas H. Hughes,
William Stanberry,
William Creighton, jr.
Robert E. B. Baylor,
William Kennon,
J. Hawkins.

That the policy which this letter recommends to the President of the United States, of employing the army on public works, is not new, may be shown, by referring as well to ancient as modern examples, and to the opinions, proceedings, and practice of our own Executive and Legislative councils.

The Roman military roads traversed not only Italy, the seat of empire, but its remotest provinces. The number leading directly from Rome, herself exceeded twenty, and reached, in extent, more than fifty thousand miles.

In France numerous highways, far surpassing those of Rome in magnificence, and useful as splendid, have been the work of the army.

The historians of Scotland number among the most efficient causes of the civilization of her highland clans, those military roads constructed by the troops of General Grant, under the orders of the British Government, immediately after the rebellion of 1715.

Near twenty years ago, a member of the delegation from Virginia, submitted to the House of Representatives the following resolution:

Extract from the journal of the proceedings of the House of Representatives of the 12th of April, 1812.

"A motion was made by Mr. Randolph, (late Senator from Virginia,) that the House do come to the following resolution:"

"*Resolved*, That the President of the United States be authorized to employ the regular army of the United States, when not engaged in actual service, and when, in his judgment, the public interest will not thereby be injured, in the construction or repair of fortifications, *roads*, *canals*, or other *works of public utility*."

In reply to a resolution of the House of Representatives of the 4th of April, 1818, the present Vice President of the United States, then Secretary of War, made a report, which was read in the House, and ordered to be printed on the 14th of January following, in which he voluntarily recommends the employment of the army on roads and canals, and, by a correspondence accompanying his report, shows that, to some extent, they had been so occupied.

With a view to vindicate this policy, the following extracts from the report and correspondence are here inserted.

"DEPARTMENT OF WAR,

"*January* 7, 1819.

"To the Hon. HENRY CLAY,

"*Speaker of the House of Representatives:*

"SIR: In compliance with a resolution of the House of Representatives of the 4th of April, 1818, 'instructing the Secretary of War to report to that House, at their next session, a plan *for the application of such means as are within the power of Congress* for the purpose of opening and con-

structing such *roads and canals* as may deserve and require the aid of Government, *with a view to military operations in time of war; the transportation of munitions of war;* and, also, a statement of the works of the nature abovementioned which have been commenced, the progress which has been made, and the means and prospect of their completion; and together with such information as, in the opinion of the Secretary, shall be material in relation to the objects of the resolution;" I have the honor to make the following report:

"A judicious system of roads and canals, constructed for the *convenience of commerce*, and the *transportation of the mail only, without any reference to military operations*, is, itself, among the *most efficient means* for "the more complete *defence of the United States.*" Without adverting to the fact, that the roads and canals which such a system would require, are, with few exceptions, precisely those which would be required for the operations of war; such a system, by consolidating our Union, increasing our wealth and fiscal capacity, would add greatly to our resources in war."

"There is no country to which a good system of *military* roads and canals is more indispensable than to the United States.

"Opposed in principle to a large standing army, our main reliance for defence must be on the militia, to be called out frequently from a great distance, and under the pressure of an actual invasion. The experience of the late war amply proves, in the present state of our internal improvements, the delay, the uncertainty, the anxiety, and exhausting effects of such calls. The *facts* are too *recent* to require details, and the impression *too deep* to be *soon* forgotten. As it is the part of wisdom to profit by experience, so it is of the utmost importance to prevent a recurrence of a similar state of things, by the application of a portion of our means to the construction of such *roads and canals* as are required, with a view to military operations in time of war, the transportation of the munitions of war, and more complete defence of the United States.

"If Louisiana were connected by a durable and well finished road with Maine, and Boston with Savannah, by a well established line of inland navigation, for which so many facilities are presented, more than half the pressure of war would be removed."

"It remains, in relation to the defence of the Atlantic frontier, to consider the means of communication between it and the western States, which require the aid of the Government.

"The interest of commerce and the spirit of rivalry between the great Atlantic cities, will do much to perfect the means of intercourse with the West. The most important lines of communication appear to be from Albany to the lakes; from Philadelphia, Baltimore, *Washington*, and Richmond, to *Ohio river*, and from Charleston and Augusta to the Tennessee; all of which are now commanding the attention, in a greater or less degree, of the sections of the country immediately interested. But in such great undertakings, so interesting in every point of view to the whole Union, and which may ultimately become necessary to its defence, the expense ought not to fall wholly on the portions of the country more immediately interested. *As the Government* has a *deep stake* in them, and as the *system of defence* will not be perfect *without their completion, it ought, at least, to bear a proportionable share of the expense of their construction.*

"For the construction of the roads and canals which Congress may choose to direct, *the army*, to a certain extent, may be brought in aid of the moneyed resources of the country.

"The *propriety of employing the army on works of public utility cannot be doubted.* Labor adds to its usefulness and health. *A mere garrison life* is equally hostile to its vigor and discipline. Both officers and men become the subjects of its deleterious effects But when the vast extent of our country is compared with the extent of our military establishment, and taking into consideration the necessity of employing the soldiers on fortifications, barracks, and roads, connected with remote frontier posts, we ought not to be sanguine in the expectation of aid to be derived from the army in the construction of permanent military roads and canals, at a distance from the frontiers. When our military posts come to be extended up the Mississippi and Missouri as far as is contemplated, the military frontier of the United States, not including sinuosities, and the coasts of navigable bays and lakes opening into our country, as was stated in a former report, will present a line of more than 9,000 miles, and including them, of more than 11,000. Thinly scattered along so extensive a frontier, it will be impossible, I fear, without leaving some points exposed, to collect any considerable bodies in the interior of the country, to construct roads and canals.

"As connected with this subject, I would respectfully suggest the propriety of making an adequate provision for the soldiers, while regularly and continually employed in constructing works of public utility. The present allowance is fifteen cents a day, which is considered sufficient in occasional fatigue duty, such as is now done at most of the posts; but if systematic employ, on permanent works, should be made the regular duty of the soldiers who can be spared for that purpose, a compensation, taking into the estimate the obligation of the government to provide medical attendance and pensions to the diseased and disabled soldiers, not much short of the wages of daily labor ought to be granted to them. Without such provision, which is dictated by justice, an increase of desertion, and difficulty in obtaining recruits, ought to be expected. Among the leading inducements to enlist, is the exemption from labor; and if the life of a soldier should be equally subjected to it as that of other citizens in the same grade, he will prefer, if the wages are much inferior, to labor for himself to that of laboring for the public. The pay of a soldier is $60 per annum; and if he were allowed, when employed permanently on fatigue, 25 cents a day, and suppose him to be employed 200 days in the year, his compensation, including his pay, would be $110 per annum, a sum, it is thought, considerably short of the average wages of labor. If this sum should be allowed, the greater portion of it ought to be paid at the expiration of the term of enlistment. If fifteen cents a day were so reserved, and the soldier should be employed one thousand days in the five years for which he is enlisted, it would constitute a sum of $150, to be paid at the expiration of his term, which ought, in the same manner as the bounty land, be made to depend upon an honorable discharge. This would furnish an important hold on the fidelity of the soldier, and would be a powerful check to the great and growing crime of desertion. An honorable discharge is now worth but little to the soldier, and the consequence is, that desertions are more frequent with those enlisted since the war, than those who were then enlisted, and are entitled to the bounty in land on their honorable discharge. The latter patiently waits the expiration of his

term of service, while the former frequently seizes the first favorable opportunity for desertion.

Should Congress think proper to commence a system of roads and canals for the "more complete defence of the United States," the disbursements of the sums appropriated for the purpose might be made by the Department of War, under direction of the President. Where incorporate companies are already formed, or the road or canal commenced under the superintendence of a State, it perhaps would be advisable to direct a subscription on the part of the United States, on such terms and conditions as might be thought proper. In other cases, and where the army cannot be made to execute it, the work ought to be done by contract, under the superintendence and inspection of officers of the engineer corps to be detailed for that purpose. It is thus the government will be able, it is thought, to construct on terms at least as favorable as corporate companies. The system of constructing all public works which admit of it, by contract, would be attended with important advantages. It has recently been adopted in the construction of fortifications, and it is expected will be attended with beneficial effects. The principal works at Mobile and New Orleans have been contracted for on terms considerably under the estimates of the engineers. With such a system extended to military roads and canals, combined with a careful inspection and superintendence by skilful engineers, will enable the government to complete them with economy, durability, and despatch.

"In the view which has been taken, I have thought it improper, under the resolution of the House, to discuss the constitutional question, or how far the system of internal improvements which has been presented may be carried into effect on the principles of our government; and therefore the whole of the arguments which are used, and the measures proposed, must be considered as depending on the decision of that question.

"The only military roads which have been commenced, are, from Plattsburg to Sackett's Harbor, through the Chataugay country; from the southern boundary of the State of Tennessee, and crossing the Tennessee river near the Muscle Shoals, to Madisonville, Louisiana; and from Detroit to Fort Meigs, at the foot of the rapids of the Miami of the Lakes. Documents marked A, B, C, show the progress which has been made. These roads have been commenced, and thus far completed, by the labor of the soldiers, who, while they are so employed, receive fifteen cents per day, with an extra allowance of a gill of whiskey. The labor of the troops is the only means within the reach of the Department of completing these roads; and as the troops are so employed only when they are not engaged in active service, it is impossible to state with accuracy when the roads will be completed.

"J. C. CALHOUN."

Extracts from the correspondence referred to in the preceding report.

Letter of Maj. Gen. Jacob Brown, commander in chief of the American army, to the Hon. John C. Calhoun, Secretary of War, dated

HEAD QUARTERS, BROWNSVILLE, *Dec.* 6, 1818.

"It is due to the command of Col. Brady and of Col Atkinson, to say, that they have discovered not only a becoming cheerfulness in obeying the orders received for perfecting the Plattsburg and Sackett's Harbor

road, but much zeal in the performance of this duty ; and if their regiments are continued upon this important work the next season, more than double the length of the way will be completed than has been passed the last and the present season."

The southern division of the army was then under the command of Gen. Andrew Jackson, and the next letter in this correspondence is from Col. Butler, the Adjutant General of his division.

"HEAD QUARTERS, DIVISION OF THE SOUTH,
"*Adjutant General's Office.*
"*Nashville, September* 19, 1818.

"SIR: On the eve of setting out for the Chickasaw treaty, I deem it necessary to inform you that no reports have been received, as yet, of a particular character, in relation to the military road now opening from Columbia, Tennessee, to Madisonville; but I am enabled to inform you officially, that fifty miles have been completed by the troops on the lower part of the road, making many causeways and bridges of the most durable materials; and the detachment on this end have progressed about forty miles south of Tennessee river, making, in like manner, many bridges and causeways.

"It is considered that the most laborious part of the road has been completed; and, from every information, it has been done in the best manner. An increase of men has been recently afforded to the detachment south of Tennessee river, which will enable it to progress with much greater facility.

"Should I receive minute reports shortly, I shall communicate their contents without delay.

"And have the honor to be,
"Very respectfully, your most obd't serv't,
"ROBERT BUTLER,
"*Adjutant General.*"

"JOHN C. CALHOUN, Esq.
"*Secretary of War.*"

From Maj. Gen Alexander Macomb, the present commander in chief of the army, to the Secretary of War.

"HEAD QUARTERS, DETROIT,
"*November* 2, 1818.

"SIR: I have the honor to report, that the military way directed to be opened from this place to the Rapids of the Miami, has progressed as far as the Eight Mile creek, that is, within eight miles of the Rapids, making in all a distance of seventy miles. The road is truly a magnificent one, being eighty feet wide, cleared of all the logs and underbrush, every low place causewayed, and all the creeks and rivers requiring it bridged in a substantial manner. The number of causeways exceed sixty, and the bridges are of considerable length. The one on which the troops are now employed is four hundred and fifty feet in length, constructed of strong oak framed work. It was found impossible to complete the road to the Rapids this season, on account of the time and labor required in throwing bridges over the larger streams: it was also deemed more essential to complete the bridges, than cut the road this season to the Rapids, as the road would be useless without the means of crossing the large streams.

"The officers and soldiers who have been employed on this service deserve much credit for the zeal and perseverance they have displayed on this occasion. The work they have performed has proved highly beneficial, both to the people of the country and to the government. Besides greatly adding to the defence and strength of this frontier, the road has been the means of developing the richness of the public lands in this Territory, and greatly augmenting their value.

"As soon as Major Anderson, topographical engineer, can complete the survey of the road, a more minute and particular description of the work will be forwarded.

"I have the honor to be,
"With great respect, Sir,
"Your ob't and very humble serv't.
"ALEX. MACOMB."

"The Hon. J. C. CALHOUN,
Secretary of War, &c. &c. &c."

A more unequivocal evidence of the opinion of the present chief magistrate in favor of such employment of the army, is furnished by recurrence to the printed report of a debate in the Senate of the United States, on the 20th of January, 1823, during the consideration of a bill from the House of Representatives, to authorize the laying out and opening certain public roads in the Territory of Florida.

The act, as it passed, with a vote of twenty-eight Senators, to eight, in its favor, provided for a road from Pensacola to St Augustine, and from Cape Sable to the intersection of the former with the Suwaney river. The second section of the act authorized the President "to employ the troops of the United States, stationed in Florida, in such manner *as he may think proper*, in the *completion*, or *in assisting* in the completion of the said road."

In aid of the troops the act appropriated $23,000.

The passage of the bill, though resisted without effect, occasioned a debate, which appears in the number of the National Intelligencer of the 23d of February, 1823, from which an extract follows:

"The bill from the other House, to authorize the laying out of a road in the Territory of Florida, was taken up in Committee of the Whole. The bill proposes an appropriation of $20,000 for the purpose of making a road from Pensacola to St. Augustine, and $3,000 for the purpose of surveying routes for two other roads intersecting said Territory at different points."

After some introductory explanation of the bill by Mr. Brown, of Louisiana, the report gives the following remarks from General Jackson, then a Senator of Tennessee.

"Mr. Jackson said, the road was of great importance from two considerations; the first as it related to the defence, the second in regard to the population of that country. If gentlemen would recur to the map of the Territory, they would perceive that it would be absolutely impossible to succor St. Augustine except by water.

"The road could be made at small expense, and would furnish the means of immediate defence. He thought the United States ought to keep an eye on that part of the country; it is now very weak and defenceless. Without this road, people could not be induced so speedily to emigrate to that Territory, and its settlement would be retarded."

In reply to an inquiry of Mr. Lowrie, of Pennsylvania, "Mr. Jackson further said, he did not doubt that the appropriation provided in this bill,

with the *labor of the military force* stationed in that part of the country, would be adequate to the proposed objects. He said, that, by this means, a topographical view of the country, through which the roads were to run, would be obtained, and the President would not apply more money to the purpose than should be found necessary."

"Mr. Chandler thought that must be a very extraordinary country indeed, if twenty thousand dollars would make three hundred miles of road in it. We have been told that the soldiers could not work in that country."

"Mr. Jackson said, he had himself marched through a considerable part of that country, and was enabled to open roads at the rate of twenty miles a day. If an army was able to open a road at that rate, he believed that $20,000 would be a sufficient sum for this purpose. He had no doubt it would be sufficient, unless bridges were to be made over the streams, which he believed was not intended."

The yeas and nays were called, and the vote was as follows: Yeas—Messrs. Barton, Branch, Brown, Eaton, Edwards, Elliott, Findlay, Gaillard, Hayne, Holmes, of Maine, Holmes, of Mississippi, Jackson, Johnson, of Louisiana, King, of Alabama, Lanman, Lowrie, McIlvaine, Mills, Parrot, Ruggles, Seymour, Smith, Talbot, Taylor, of Indiana, Thomas, Van Buren, Ware, and Williams—twenty-eight Senators voting for the bill; and Messrs. Bell, Chandler, Clayton, De Wolf, Knight, Macon, Taylor, of Virginia, and Van Dyke, eight Senators, voting against it.

At the next session of Congress, the same distinguished Senator from Tennessee, acting as chairman of the Military Committee of the Senate, upon a memorial of the General Assembly of the State of Louisiana, praying "that measures may be taken, either *by the labor of the troops*, or in such other way as may be deemed proper, to construct a road on both sides of the river," (Mississippi,) "from Fort St. Philip to the English Turn," (a distance of about seventy miles, as the report and document show,) made the report which appears among the printed documents of the Senate in the following language.

"18th Congress, 1st Session. In Senate of the United States, January 23d, 1824. Mr. Jackson, from the Committee on Military Affairs, to whom was referred the report of the Secretary of War, respecting a military road from Fort St. Philip to the English Turn, made the following report:

"That your committee has had the same under consideration, and fully agree in the sentiment expressed in the memorial of the Legislature of the State of Louisiana, that Fort St. Philip is a post of the utmost importance to the defence of New Orleans, being the only fortress to prevent the approach of an enemy to that city by the river Mississippi, and that that fort may be very much endangered by reason of the extreme difficulty of communicating with it. That during the late siege by the British forces, this difficulty was sensibly felt; and it was greatly feared that it might lead to its capture, for want of a road by which it could be reinforced. Your committee, therefore, view a military road, leading from Fort St. Philip to the English Turn, as absolutely necessary to the defence of New Orleans, and to the safety of that fortress, in a state of war; and have reported a bill, authorizing the President to cause the said military road to be made agreeably to the report of the Engineer Department, and the memorial of the Legislature of Louisiana, herewith presented for the information of the Senate."

It is believed that before this period, or any express authority given to the Executive by Congress, the troops of the United States were occasion-

ally employed and received extra pay, for fatigue duty, while at work on public roads, by order of the President of the United States.

But repeated acts of Congress have since specially directed such employment of them.

Such are, among others, "An act, approved March 3d, 1827, authorizing the completion and *repairs* of certain roads in the Territory of Florida, and for other purposes," which provides for opening the *public road* "from the Georgia line, by St Augustine, to New Smyrna on the Atlantic, at the head of Indian river;" and, by its second section, "authorizes the President to employ the troops of the United States stationed in Florida, in such manner as he may think proper, in opening and repairing the said road," and appropriates $11,000 to that object.

Another "Act to provide for the completion of the road from Memphis, in the State of Tennessee, to Little Rock, in the Territory of Arkansas, and for other purposes," approved March 3d, 1827; which authorizes the employment of "such part of the troops of the United States as the President may think proper, to *survey* and construct a road from Fort Smith, on the Arkansas river, to Fort Towson, on the Red river, and thence in the direction of Natchitoches.

An act subsequent to the last, "To open the King's road in Florida;" also, "An act to complete the road from Pensacola to St. Augustine," which passed in the session of 1827 and 1828; and an act, approved May 24th, 1828, "To provide for opening and making a military road in the State of Maine," which authorizes the President "to employ such part of the troops as he may think proper, to *survey and construct* a road" from the Penobscot to Mars' Hill, "near the eastern boundary of Maine," and appropriates, moreover, $15,000 to the object.

The authority of the President to employ the army on such public works, under the existing terms of enlistment, being thus sustained by the long settled practice of the government, and the approbation as well as the acquiescence of military men, in conformity with the policy laid down in the able report of a former Secretary of War, now the Vice President of the United States, the exercise of this power, in the mode proposed by more than seventy members of the present Congress, may, it is hoped, be confidently expected, and, in that event, the entire line of the Chesapeake and Ohio canal may be completed in less than five years from the commencement of the tunnel through the Allegany. (See note, where this subject is more fully examined, with a view to the time of completion of this part of the work.) If it be objected that the utility of the whole work should await the issue of the rail road experiments now in progress in Europe and America, then it should be deemed sufficient to state, that, on the railway contemplated by Pennsylvania, between the Juniata and Johnstown on the Conemaugh, a branch of the Alleghany river, a tunnel of one mile passing through the dividing mountain at a depth of 177 feet below its summit, and an elevation of 1264 feet above the canal, has been recommended, as essential to the success of that work, by an engineer of established reputation, who recently traversed Europe in his zeal to master the science and practice of his profession. Tunnels being, in fact, as frequent on rail roads in Europe as on canals, and reaching in some cases, on the latter, very near or quite the length here proposed, without the same facilities in their construction for disposing of their excavated materials, although, it is admitted, without ever passing under as great an elevation of superincumbent ground.

L.

Extract from a pamphlet printed in Baltimore in the year 1827, entitled "Proceedings of sundry citizens of Baltimore, convened for the purpose of devising the most efficient means of improving the intercourse between that city and the Western States," which shows that the founders of the Baltimore and Ohio rail road, in a publication designed to recommend their enterprise to the States who granted their charter, avowed a determination to make a *direct road* from Baltimore to the Ohio river, one hundred and forty miles shorter than the ascertained length of the route to the Ohio, from Baltimore, by the Chesapeake and Ohio canal.

"BALTIMORE, *February* 12, 1827.

"At a meeting of a number of citizens to take into consideration the best means of restoring to the city of Baltimore that portion of the western trade which has lately been diverted from it by the introduction of steam navigation and by other causes, William Patterson, Esq. was appointed chairman, and David Winchester secretary.

"Various documents and statements, illustrating the efficiency of rail roads for the conveying of articles of heavy carriage at a small expense, were produced and examined; and the superior advantage of this mode of transportation over turnpike roads or canals, in many situations, being, according to those statements, satisfactorily shown, it was, on motion, resolved that the said documents be referred to a committee, whose duty it shall be to examine the same, together with such other facts and experiments as they may be able to collect; and, when prepared, to report their opinion thereon, and on the course it may be deemed proper for this meeting to pursue.

"Resolved, That Philip E. Thomas, Benjamin C. Howard, George Brown, Talbot Jones, Joseph W. Patterson, Evan Thomas, and John V. L. M'Mahon, compose the said committee.

"Adjourned to meet on Monday evening the 19th instant."

"At a meeting held, pursuant to the foregoing adjournment, February 19, 1827, William Patterson, Esq. was called to the chair, and David Winchester was appointed secretary. The committee produced the report:

"The committee to whom were referred sundry documents and statements, illustrating the relative or comparative advantages of canals and rail roads, for connecting the trade of the city of Baltimore with the Western States, having carefully examined the said documents and statements, together with such additional facts and evidences as they have been able to collect, beg leave now to submit the following report:"

Extracts, from this report, of quotations from other works.

"A railway is equally suited to a mountainous or level country, and either horses or locomotive engines may be used upon it, (though not with advantage, at the same time, from their difference of velocity,) the wagons being drawn along by the locomotive engine, which derives its motion from the contact and friction of the wheels against the rails, the wheels being attached directly to the steam engine. Where a railway is level, the power required to move the wagons is little more than the friction, which is found to amount to about a 200th part of the weight to be conveyed; or, in other

words, a power of one pound applied in the direction of the motion will draw forward 200 pounds."

"Where ascents and descents were unavoidable, they were obviated by the introduction of inclined planes, up which the loaded wagons were drawn by stationary engines, or the loaded wagons descending drew up the empty ones."

"Canals take the richest land, and are circuitous by following the valleys, and the carriage from them is ascending Railways may pass along the tops and sides of hills, from whence the carriage of coals and heavy goods will be conveyed into the neighborhood without the obstacles of hills, and their elevation admits of branches from them at little expense wherever mines or a populous village make it desirable."

"The committee (say they) are much gratified to find themselves fully sustained in the opinion they have here endeavored to enforce, of the superiority of a rail road over any other means of communication between the city of Baltimore and the Western States, by a very able report, lately made by a committee of the Legislature of Massachusetts, who, it appears, had been appointed to ascertain the most eligible means of opening a direct inland communication between Boston and the Hudson river at Albany. The district of country between those places being in many respects similar to that between us and the Ohio river, renders this report the more interesting to us: the committee, therefore, take leave to offer the following extracts from it."

The committee, after showing the importance of the proposed rail road, by many extracts from the report of the United States' engineers on the plan, route, and estimated cost of the Chesapeake and Ohio canal, which manifest their familiar acquaintance with the proposed direction of that work along the valley of the Potomac, proceed to give the following description of their own enterprise. They tell the public, in characters sufficiently large, that—

"In conclusion, the committee beg leave to refer to the annexed tables, numbered from 1 to 7, in which they have arranged, under a condensed form, some of the more important facts and statements embraced in this report. The committee have also in these tables contrasted the advantages, which, in their opinion, would be likely to accrue to the city of Baltimore, from connecting her trade with the Western States, by intersecting the contemplated Chesapeake and Ohio canal within the District of Columbia, and by A DIRECT RAIL ROAD FROM BALTIMORE TO SOME ELIGIBLE POINT ON THE OHIO RIVER.

"All which is respectfully submitted.

"PHILIP E. THOMAS,
"*Chairman of the Committee.*"

"The report being read and considered, was unanimously approved by the meeting. Whereupon, it was, on motion,

"*Resolved*, That immediate application be made to the Legislature of Maryland, for an act incorporating a joint stock company, to be styled "The Baltimore and Ohio Railway Company," and clothing such company with all the powers necessary to the construction of a rail road, with two or more sets of rails, from the city of Baltimore to the Ohio river.

"*Resolved*, That the capital stock of said company shall be five millions of dollars, but that the company shall be incorporated, and provision shall be made by said act for its organization, upon the subscription of one million of dollars to said stock; and that the said company shall have power to increase the capital stock thereof, so far as may be necessary to effect said objects.

"*Resolved*, That it is expedient and proper, in said act, to permit subscriptions of stock to the same to be made by the United States, y States, corporations, or individuals; and to provide that, as soon as the said act shall have been passed by the Legislature of Maryland, subscription books may be opened, subscriptions received, the company organised, and the said road constructed, so far as it may lie within the limits of the State of Maryland; and that the assent of the Legislatures of Pennsylvania and Virginia to the said act shall be obtained as speedily as possible, but shall be made necessary, only so far as, in constructing the said road, it shall be found necessary to pass through their respective States.

"*Resolved*, That a committee, consisting of 25 members, be appointed by the chairman of this meeting, whose duty it shall be to prefer an application to the Legislature of Maryland for such an act of incorporation.

"The following committee was then appointed to carry into effect the object of the meeting, to wit:

Charles Carroll, of Carrollton,	Philip E. Thomas.
William Patterson,	William Lorman,
Isaac M'Kim,	George Warner,
Robert Oliver,	Benj. C. Howard,
Charles Ridgely, of Hampton,	Solomon Etting,
Thomas Tenant,	W. W. Taylor,
Alexander Brown,	Alexander Fridge,
John M'Kim, jun.	James L. Hawkins,
Talbot Jones,	John B. Morris,
James Wilson,	Luke Tiernan,
Thomas Ellicott,	Alexander M'Donald,
George Hoffman,	Solomon Birckhead,
William Steuart,	

"*Resolved*, That 1,500 copies of the foregoing report, and of the proceedings of this meeting, signed by the chairman and secretary, be published for circulation.

"The meeting then adjourned *sine die*.

"WILLIAM PATTERSON, *Chairman*.

"DAVID WINCHESTER, *Secretary*."

Then follow the annexed tables, viz:

"TABLE No. I.

"Estimated difference in the distance between connecting the city of Baltimore with the western trade, by a continuous canal, intersecting the eastern termination of the proposed "Chesapeake and Ohio canal," within the District of Columbia, and of connecting Baltimore with this trade by a railway *direct* from that city to some suitable point on the Ohio river.

The United States' engineers report the length of the "Chesapeake and Ohio canal," from the city of Washington to Pittsburg, on the Ohio river, to be - - - - - - -	341½ miles.
Estimated length of a canal from Baltimore, to intersect the "Chesapeake and Ohio canal" at Washington, -	48½ miles.
Whole distance of a canal by this route from Baltimore to Pittsburg, - - - - - - -	390 miles.

Estimated distance of a rail road, from the city of Baltimore to Wheeling, or some other suitable point on the Ohio river, - - - - - -	250 miles.
Distance saved by a rail road,	140 miles.

TABLE No. II.

Comparative cost of constructing a canal communication between the city of Baltimore and the Ohio river, by the proposed route of the "Chesapeake and Ohio canal," and by the proposed *direct* rail road communication between Baltimore and that river.

The United States' engineers estimate the cost of the proposed canal from Washington to Pittsburg to be ($22,375,427) twenty-two millions three hundred and seventy-five thousand four hundred and twenty-seven dollars; but we will suppose it could be made for one half of this sum, or - -	$11,000,000 00
To which should be added the cost of constructing a continuous canal from the city of Baltimore to the eastern termination of the "Chesapeake and Ohio canal," at Washington, that being the only point at which we can intersect it, - - -	1,000,000 00
	$12,000,000 00
The highest estimated cost of a rail road from Baltimore to the Ohio river, calculating the same to cost $20,000 per mile, (and this is believed to be a very high estimate,) would be - -	5,000,000 00
Amount of capital saved in favor of a rail road,	$7,000,000 00

TABLE No. III.

Estimated difference of expense on transportation for tolls only, by the *proposed* canals from Baltimore through the District of Columbia to Pittsburg, and by a *direct* rail road route from Baltimore to some point on the Ohio river.

The United States' engineers estimate the cost of transportation by the proposed Chesapeake and Ohio canal at the rate of 1½ cents for each ton per mile—Taking the whole distance then from Baltimore to Pittsburg, as is shown in Table No. I, to be 390 miles, the tolls for conveying a ton of freight from Baltimore, the whole distance along this canal, would be - - - - -	$5 85
Tolls for carrying the same freight along the proposed rail road at the same rate per mile, the distance being 250 miles, would be - - - -	3 75

Amount of freight saved per ton in favor of a rail road, at the same charge for tolls, would be	2 10
In order, however, to show the actual saving by the rail road, it is necessary to remark that the proposed charge along it is not 1½ cents per ton each mile, as charged on the canal, but one cent per ton each mile, and this will give a further advantage in favor of the road on each ton of	1 25
Making the difference per ton in favor of the rail road to be	$3 35

TABLE No. IV.

Estimate of the income which the proposed rail road from Baltimore to some point on the Ohio river would annually yield, computing the freight which would pass on this road to be only 150,000 tons from west to east, and the amount that would pass from east to west to be 50,000 tons.

150,000 tons from west to east, at 1 cent per ton per mile, being the New York canal price,	$375,000 00
50,000 tons from east to west, at 3 cents per ton per mile, being the New York canal price,	375,000 00
Total amount of tolls,	$750,000 00

TABLE No. V.

Estimate of profits to the holders of stock in the proposed Baltimore and Ohio rail road.

Expense of constructing the proposed road, being estimated at $20,000 per mile, and the distance being assumed to be 250 miles, would make the whole cost five millions of dollars,	$5,000,000 00
Six per cent. interest on the above capital invested, would be	300,000 00
Income from tolls, as is shown by Table No. 4,	750,000 00
Which leaves $450,000 for repairs, contingent expenses, and surplus dividends,	$450,000 00

TABLE No. VI.

Estimated difference of the time it would take for conveying freight from Baltimore to Pittsburg, by the proposed Chesapeake and Ohio canal, between those places, (through the District of Columbia,) and by a *direct* rail road from Baltimore to some point on the Ohio river.

The United States' engineers estimate the time it will take to travel with loaded boats from Washington to Pittsburg, to be	188 hours.

The distance between these points being 341 miles, we have only to add the same rate of travelling for the additional distance from Baltimore to Washington, say 48½ miles, and the additional time will be - - - 26½ hours.

Time employed in passing on the proposed canal, from Baltimore to Pittsburg, - - - - - 214½ hours.

There is abundant evidence to prove, from authentic documents published, that the rate of travelling upon rail roads with the locomotive engines, in England, (and this has been sufficiently shown to be the cheapest means,) is, with heavy loaded wagons, from 4 miles to 6 miles and even 8 miles per hour; assuming, however, the slowest rate, and the passage will be made from Baltimore to the Ohio river, say 250 miles, at the rate of 4 miles per hour, is 62½ hours.

Time saved in favor of the rail road, each trip, - - 152 hours.

TABLE No. VII.

Synopsis of the six preceding Tables.

Table 1.

Distance between Baltimore and Pittsburg, by the proposed Chesapeake and Ohio canal, - -	390 miles.
Distance from Baltimore to the Ohio river by the proposed rail road, - - - - -	250
Distance saved by the road,	140 miles.

Table 2.

Smallest estimated cost of the proposed Chesapeake and Ohio canal, - - - - - -	$12,000,000 00
Highest estimated cost of the contemplated rail road,	5,000,000 00
Amount of capital saved in favor of the road,	$7,000,000 00

Table 3.

Cost of transporting, for tolls only, on a ton of freight from Pittsburg to Baltimore, upon the Chesapeake and Ohio canal, - - - - - -	$5 85
Cost of same transportation by the proposed rail road, -	2 50
Tolls saved on each ton by the rail road, - -	$3 45

Tables 4 *and* 5.

Annual income from tolls upon the proposed rail road,	$750,000 00
6 per cent. interest on the capital invested, - -	300,000 00
Annual surplus profits, to be appropriated for repairs and extra dividends, - - - -	$450,000 00

Table 6.

Time employed in passing a boat from Baltimore to Pittsburg, by the Chesapeake and Ohio canal, - -	214⅓ hours.
Time to pass from Baltimore to the Ohio river upon the proposed rail road, - - - - -	62½ hours.
Time saved by the road, each trip,	152 hours.

After the wide diffusion, by 1500 copies, of this pamphlet, it cannot require other evidence of the total ignorance of the Chesapeake and Ohio canal convention, and their central committee, who met occasionally in Washington, of the danger which threatened their long labored enterprise from the new rival which had just sprung up.

But they had other manifestations from the patrons of this rival enterprise, which would have lulled the suspicion of such danger, had it existed.

The chairman of the Baltimore committee had been appointed, and had not declined acting as a commissioner, to open books for a subscription of stock to the Chesapeake and Ohio canal. Moreover, he, and several of his highly respectable associates in this rival enterprise, had been on the 6th, 7th 8th, and 9th days of December, 1826, the acting representatives of the citizens of Baltimore, at the second assemblage of the Chesapeake and Ohio canal convention in the capitol of the United States; the proceedings of which were conducted with unprecedented unanimity, and were marked by the following extraordinary occurrences—extraordinary, considering the proceedings above noticed of the same gentlemen, in the ensuing month of February of the same winter.

They manifest the perfect acquaintance of the founders of the Baltimore and Ohio rail road with the plan, route, and estimate of the Chesapeake and Ohio canal, and were calculated to exclude the idea of any possible interference between the canal and railway.

Proceedings of the Chesapeake and Ohio Canal Convention, which assembled in the Capitol of the United States, in the City of Washington, on the 6th day of November, 1823, *and re-assembled in the same city on the sixth day of December*, 1826.

"FIRST SESSION.

"THURSDAY, *the 6th day of November, A. D.* 1823.

"Delegates chosen by the people of various counties in the States of Virginia, Maryland, Pennsylvania, and Ohio, and by the several Corporations and other interests of the District of Columbia, assembled in the Capitol in the city of Washington, as a Convention, to take into consideration the practicability and expediency of uniting, by a canal navigation, the waters of the Chesapeake bay with those of the river Ohio; and to devise ways and means to effect that object."

The following are the Resolutions as amended by the Committee, and finally passed by an unanimous vote of the Convention.

"Whereas a connexion of the Atlantic and western waters, by a canal leading from the seat of the General Government to the river Ohio, regarded as a local object, is one of the highest importance to the States immedi-

ately interested therein, and, considered in a national view, is of inestimable consequence to the future union, security, and happiness of the United States:

1. *Resolved, unanimously*, That it is expedient to substitute, for the present defective navigation of the Potomac river above tide water, a navigable canal by Cumberland to the mouth of Savage creek, at the eastern base of the Alleghany, and to extend such canal, as soon thereafter as practicable, to the highest constant steamboat navigation of the Monongahela or Ohio river.

That the most eligible mode of attaining this object will be by the incorporation of a joint stock company, empowered to cut the said canal through the territory of the United States in the District of Columbia, and of the States of Virginia, Maryland, and Pennsylvania; and, therefore, that committees be appointed, each consisting of five delegates, to prepare and present, in behalf of this Assembly, and in co-operation with the Central Committee hereinafter provided, suitable memorials to the Congress of the United States and the Legislatures of the several States before named, requesting their concurrence in the incorporation of such a company, and their co-operation, if necessary, in the subscription of funds for the completion of the said canal.

And whereas, by an act of the General Assembly of Virginia, which passed the 22d February, 1823, entitled "An act incorporating the Potomac Canal Company," the assent of that State, so far as the limits of her territory render it necessary, is already given to this object—and for its enlargement, to the extent required by the preceding resolution, the said act appears to furnish, with proper amendments, a sufficient basis:

Be it therefore resolved, That it will be expedient to accept the same as a charter for the proposed company, with the following modifications, viz:

That, in reference to its enlarged purpose, the name be changed to "The Chesapeake and Ohio Canal:"

That provision be made for the assent of the Government of the United States, and of the State of Pennsylvania, to the said act, and that the act be made to correspond in its details with such provision:

That the Chesapeake and Ohio canal shall be divided into two sections, eastern and western; the former of which shall correspond in description with that of the Chesapeake and Ohio canal by the preceding resolution, and the latter shall begin at the western extremity of the former and terminate at the head of the steamboat navigation of the Monongahela or Ohio river:

That, while the act shall allow a reasonable time for the commencement and the completion of both sections of the canal, no other forfeiture shall be incurred, after the eastern section is finished, for a failure to begin or complete the western section within the term prescribed, except of the right to complete such section, and of all interest therein:

That, while the consent of Pennsylvania is provided for, in the amended act, it shall not be indispensably requisite to the validity of the charter, so far as respects the authority granted by it, to extend the Chesapeake and Ohio canal to the Pennsylvania line:

That it will be both just and expedient, if not absolutely necessary, to limit the interest of the stockholders of the Potomac Company, in the stock of the Chesapeake and Ohio canal, in the mode provided by the unanimous resolution of the company of the 7th day of February last, a copy of which is hereto annexed:

That the said canal shall not, in width, be less at the surface than 40 feet, at its bottom than 28, nor its depth of water be short of four feet, except where, from the nature of the ground, it may be necessary for the greater security of the banks of the canal, to reduce its breadth at its base to less than 28 feet:

That the maximum profit of the said company shall not exceed 15 per cent. after the entire canal shall have been completed; but if, at any time after the completion of the eastern section thereof, and before sufficient funds shall have been otherwise provided for the completion of the western, the tolls of the canal shall yield a nett income to the stockholders exceeding 10 per cent. per annum, such excess shall be applied towards the extension of the canal until the western section shall have been completed; and to give more speedy effect to this provision, the President and Directors of the Chesapeake and Ohio Canal Company shall be authorized to borrow, or may negotiate, through a suitable agency, in behalf of the company, on the credit of such excess, or on the tolls, or a fixed part thereof, levied upon certain commodities passing through the said canal, being the probable amount of such annual excess, such sums of money as may be deemed expedient, by a general meeting of the stockholders, to be applied to the extension of the western section of the canal, from time to time, till the said section shall have been completed. And if, after the completion of the entire canal, the nett dividends shall exceed 15 per cent. per annum, such excess shall be applied, first, to strengthening the works of the canal; next, to the multiplication of ascending locks from the river Potomac to the level of the canal, wherever the convenience of the adjacent country may require it; next, to lining the canal throughout with such walls of stone as shall accommodate its banks to the use of steamboats; and should the nett dividends still exceed 15 per cent. then such excess shall be applied to the reduction of the tolls upon the said canal, according to some equitable scale.

The act aforesaid be amended, by inserting, in lieu of the 18th section thereof, the following:

"*And be it further enacted*, That the right to the waters of the river Potomac, for the purpose of any lateral canal or canals, which the State of Virginia or Maryland may authorize to be made, in connexion with the said canal, is reserved to the States respectively: That a similar right is reserved to the State of Pennsylvania, in relation to the rivers and streams within the territory of that State, the waters of which may be used in supplying the western section of the said canal: That the Government of the United States shall retain the power to extend the said canal or through the District of Columbia, on either or both sides of the river Potomac. And the State of Maryland or Virginia shall be empowered, under the sanction given by the United States to this act, to authorize any such extension, for the purpose of meeting any canal, so extended, by any other canal, which either State deem it expedient to conduct, in any direction whatever, through its territory.

"*Provided, however*, That no part of the waters of the river Potomac, or of any other river or stream, required to ensure the constant, safe, and convenient use of the navigation of the canal hereby authorized to be made, shall be, by any such lateral or continued canal, diverted therefrom, to the impediment or injury of the said navigation."

2. *And be it further resolved*, That, in addition to the provision contained in the first section of the act aforesaid, there be grounded on the

event of its failure to furnish adequate funds for the completion of the eastern section of the canal, to be obtained through separate acts of the respective Governments and Corporations, of the States of Maryland and Virginia, of the United States, and of the three cities of the District of Columbia, a subscription to the amount, if necessary, of 2,750,000 dollars, in the following proportions: 2-11ths to be subscribed by the State of Maryland, 3-11ths by the State of Virginia, 4-11ths by the United States, and 2-11ths by the District cities, to be divided between them, according to an equitable ratio, to be fixed by themselves. In case a part of the sum aforesaid shall be subscribed by private individuals, in the mode provided by the act aforesaid, the several States and Corporations, within which such individual subscriptions are received, shall be requested to assume, as part of their aforesaid quotas, the amount of such subscription, under such security as they may deem expedient for the payment thereof, by the subscribers, to them respectively:

That the Government of the United States be earnestly solicited to obtain the whole of this sum on loan, receivable in four annual instalments, upon the issue of certificates of stock, bearing an annual interest not exceeding five per cent. and irredeemable for thirty years, and to guaranty the repayment thereof on a specific pledge of the public lots in the city of Washington, of the United States' stock in the canal, and the public faith:

That the first instalment of the loan be made payable on the 1st of March, 1825, and the last on the 1st of March, 1829:

That the interest of each State and Corporation, upon its proportion of the said loan, be paid into the Treasury of the United States, according to the terms of the loan, and the principal sum at the expiration of thirty years, the period to be fixed for its redemption:

That, in the event of a refusal by the Government of the United States to negotiate the said loan, each State and Corporation shall provide the amount of its respective subscription, in such manner as may seem to it best.

3. *And be it further resolved*, That a committee of five delegates be appointed to prepare, and cause to be presented, in behalf of this Convention, a suitable memorial to the State of Ohio, soliciting the co-operation of that State in the completion of the Chesapeake and Ohio canal, and its ultimate connexion with the navigation of lake Erie; and that, for the latter purpose, the memorial shall respectfully suggest the expediency of causing the country, between the northernmost bend of the river Ohio and the southern shore of lake Erie, together with the waters of Great Beaver and Cayuga creeks, and all other intervening waters near the said route, to be carefully surveyed, with the view of ascertaining the practicability and probable cost of a canal, which, fed by the latter, shall connect the former:

That a letter be addressed by the Chairman of the Convention to the Mayors of Alexandria, Georgetown, and Washington, apprising, through them, their respective Corporations of the proceedings of this Convention, and inviting their zealous co-operation in giving to them effect:

That another letter be addressed by the Chairman, in behalf of this Convention, to the President and Directors of the Potomac Company, requesting their concurrence in the measures recommended by the preceding resolutions.

4. *And be it further resolved*, That the committee before named be, and they are hereby, authorized and requested to use their best exertions to obtain the most favorable reception for their memorials, to ascertain and communicate to the Central Corresponding Committee hereinafter named,

such objections, if any, as are opposed to the prayers of their respective memorials, and to devise, if possible, in conjunction with the common friends of the union and prosperity of the United States, the means of obviating all the impediments to their success.

5. *And be it further resolved*, That, for the last mentioned purpose, the delegates of the respective counties and Corporations, represented in this Convention, be regarded also as Corresponding Committees, and that thirteen delegates be appointed a Central Committee of Correspondence, to confer with the committees before named, and to hold stated meetings in the city of Washington, for the purpose of consulting upon, and adopting in behalf of, the Chesapeake and Ohio canal, such measures as may seem best calculated to assure its certain and speedy completion.

JOSEPH KENT, *Chairman.*

WALTER JONES, *Secretary.*"

The following Committees were appointed by the Chairman.

Central Committee.—Charles F. Mercer, John Mason, Walter Jones, Thomas Swan, John M'Lean, William H. Fitzhugh, H. L. Opie, Alfred H. Powell, P. C. Pendleton, A. Fenwick, John Lee, Frisby Tilghman, Robert W. Bowie.

Committee for Virginia.—Philip C. Pendleton, H. L. Opie, J. C. Hunter, W. Ellsey, Nathan Burwell.

Committee for Pennsylvania.—James Shriver, James Shannon, John M'Mahon, Daniel Kincheloe, George Hagan.

Committee for Maryland.—Grafton Duvall, George Mason, of Charles county, T. Kenedy, J. C. Herbert, Gen. James Forrest.

To memoralise Congress.—Walter Jones, John Mason, G. W. P. Custis, Robert I. Taylor, Samuel H. Smith.

Committee for Ohio.—John M'Lean, Walter Smith, Benjamin S. Forrest, Thomas Carbery, H. Peake.

A charter having been obtained, surveys and a location of the canal made, with an estimate of its cost, to revise that estimate the convention were called together at the instance of their Central Committee, and by the request of the commissioners appointed by the United States and the States of Maryland and Virginia, to receive subscriptions of stock to the Chesapeake and Ohio canal, preparatory to the opening of the books of subscription.

Accordingly the convention reassembled on Wednesday the 6th of December, 1826. The following are extracts from the printed journal of their proceedings.

"PROCEEDINGS OF THE CONVENTION—SECOND SESSION.

"WEDNESDAY, *6th December*, 1826.

"The Chesapeake and Ohio Canal Convention assembled, agreeably to adjournment and to public invitation, this day at 12 o'clock. The chair was resumed by Governor KENT, and WALTER JONES continued to act as Secretary.

Mr. POWELL nominated JAS. S. CRAFTS, of Pittsburgh, as assistant Secretary, and he was unanimously appointed to, and accepted that office.

It was then stated that those who had acted as delegates at the former session of the Convention, would be considered members of the present, and those who had not were requested to hand in their names, and verify their powers.

The following is the roll of the delegates to the former, as well as the present session of the Convention.

Among the members present, who, on being called, answered to their names, were the following from the city of Baltimore, viz: Solomon Etting, Benjamin C. Howard, William Lorman, Isaac McKim, Joseph W. Patterson, and Philip E. Thomas; the last named being one of the commissioners appointed by the Governor and Council of Maryland to receive subscriptions to the stock of the canal.

Of the Baltimore delegation, the following gentlemen did not attend, viz: Thomas Ellicott, Roger B. Taney, and Luke Tiernan.

On Thursday the 7th of December, being the second day of the session of the convention,

Mr. McKim, of Baltimore, offered the following resolution:

Resolved, As the sense of this Convention, that the interests of the extensive district of country upon the route of the contemplated Chesapeake and Ohio canal render it highly proper that a continuous canal navigation should be provided from some point upon the line or at the termination of said canal, to the city of Baltimore.

And whereas doubts may exist whether the acts of legislation now in force have fully provided for the attainment of that desirable object—Therefore,

Resolved, That the committee heretofore appointed for the purpose of inquiring whether any, and what, alterations are necessary in the various laws relative to the canal, be, and they are hereby, specially instructed to inquire whether any, and what, further acts of legislation are necessary for the security of the object stated in the preceding resolution.

The resolution was agreed to."

"Friday, *December* 8.

"Mr. Foster, of Pennsylvania, from the committee appointed to examine the laws of the different States passed in relation to the canal made the following report:

"The committee to whom was referred the resolution—That a committee of four delegates from each of the States of Virginia, Maryland, Pennsylvania, and Ohio and the District of Columbia, be appointed to examine the different legislative acts that have been passed relative to the Chesapeake and Ohio canal, and report whether any, and, if so, what, additions, alterations, or amendments, may be necessary in said laws, and what farther provision should be made, in order to carry into complete effect the objects of the Convention.

Also, to inquire and report whether any, and what further acts of legislation are necessary for the security of a continuous canal navigation from some point upon the line or at the termination of the Chesapeake and Ohio canal, to the city of Baltimore, respectfully report:

That although it be possible that some amendments might be beneficially made in the charter, and that it may require some further revision, yet the committee does not perceive in any of the proposed subjects of amendment (except that recommended in the first resolution reported from the Central Committee,) any necessity for immediate legislation or memorial; but that the same may be postponed without detriment or inconvenience.

The committee therefore recommend, that all proposals for any change or amendment in the charter, be, for the present, limited to the one proposed in the said resolution of the Central Committee.

The committee is not aware of any specific provision necessary to be made beyond the existing provisions of the charter, for a lateral canal to

Baltimore; but has entire confidence that all which good faith and justice require to be done, in order to give effect to the existing provisions of the charter in favor of such canal, will, when the occasion shall arrive, be done by the proper legislative authority."

Mr. Foster accompanied the report by some observations, in which he stated briefly the reasons which had induced the committee to come to the conclusion they had stated, in relation to the lateral canal to Baltimore.

Mr. Howard, of Baltimore, then offered a resolution to amend the report, by striking out so much as related to that subject, with a view to insert the following substitute:

Resolved, That Congress be requested to enact a law expressly securing to the State of Maryland, and to any company to be incorporated by the said State, the right to take and continue a canal from any point of the Chesapeake and Ohio canal through the territory of Columbia, or any part thereof, to the said State, in any direction it may think proper, upon the same terms and conditions, and with all the rights, privileges, and powers, of every kind whatever, granted to the Chesapeake and Ohio Canal Company, by the act of incorporation, in case it should be determined by Congress that such connexion can be made without impediment or injury to the navigation of the Chesapeake and Ohio canal.

This motion gave rise to an able and interesting legal discussion on the interpretation of an act of Congress, confirming the character of the Canal Company ; in which Messrs. Howard, of Baltimore, Nelson, of Fredericktown, Mercer, of Virginia, Jones, of Washington city, Pigman, of Maryland, Foster, of Pennsylvania, Clay, Maxcy, of Maryland, and Powell, of Virginia, took part ; which resulted in the rejection of Mr. Howard's proposition to strike out, by a large majority.

Mr. Reed, of Carlisle, Pa., then moved that the report be amended, by adding thereto the following clause :

But, while the Convention makes this candid expression of opinion in reference to the necessity of any change in the laws of the United States, securing to Maryland the right of constructing a canal through the territory of Columbia, yet, from a respect which is due to doubts entertained in the State of Maryland, with regard to the want of precision in the terms of the act of Congress in relation to the guarantee, the Central Committee, or other committee of this Convention, to which may be committed the duty of presenting any memorial to Congress on the subject of the Chesapeake and Ohio canal, is instructed to insert a clause in such memorial, respectfully requesting of Congress to pass a declaratory act, expressly securing the right claimed by Maryland upon the terms and conditions prescribed by the second section of the act of Congress of the 3d of March, 1825, confirming the acts of the Legislatures of Virginia, Maryland, and Pennsylvania.

After some remarks and explanations by Mr. Mason, of Georgetown, and Mr. Lee, of Montgomery, in relation to the last law of Maryland above referred to, the amendment offered by Mr. Reed was unanimously agreed to, and the report adopted.

SATURDAY, *December 9.*

The remaining resolutions recommended by the Central Committee were taken up; and the following being under consideration :

Resolved, That it will be expedient to obtain such an amendment of the charter of the Chesapeake and Ohio Canal Company, as shall authorize the company to terminate, if they deem proper, the eastern section of said

canal, at or near the town of Cumberland ; and to extend, by any route therefrom, the western section of the said canal across the Alleghany to Pittsburg, or to substitute therefor a railway. And, in the event that such a change shall be deemed expedient, in the route now prescribed by the charter, to defer the extension of a canal along the Potomac, from Cumberland to the mouth of Savage, and to reduce the dimensions thereof to a breadth less than that now required.

Mr. Kennedy moved to strike out the words "*or to substitute therefor a railway.*"

Mr. Key moved to add, "or such other mode of transportation as they may find expedient."

Mr. Kennedy's motion was negatived.

The resolution was adopted by adding to the first resolution of the Central Committee, after the word "railway"—or turnpike road on that portion of the route, or any part thereof, designated in the report of the Board of Internal Improvement, of the 23d October, 1826, as the middle section, or on that part of the route by Savage which corresponds therewith.

The second resolution of the Central Committee, in the following words, was taken up;

Resolved, That it will be expedient to address a memorial to the Congress of the United States, requesting a subscription to the stock of the said canal, and a like memorial to the Legislatures of Virginia, Maryland, and Pennsylvania ; and that an application be made to the cities of Washington, Georgetown, and Alexandria, to aid, by a similar subscription, the stock of the said company.

On motion of Mr. Etting, the word "Baltimore" was added, after the word "Alexandria," in the foregoing resolution."

The knowledge possessed by the founders of the Baltimore and Ohio railway of the superiority of rail roads, to canals, was comprised in the pamphlet detailing these proceedings, from which, copious extracts have already made part of this report.

It is there introduced in the following language of the report of their committee, beginning on the 7th page of the proceedings.

"The stock of information upon the general subject of rail roads, now in the possession of the committee, is admitted not to be very extensive, but they have gleaned from the several publications and reports which they have examined upon this interesting subject, enough to leave no doubt upon their minds, that these roads are far better adapted to our situation and circumstances that a canal across the mountains would be: they therefore recommend that measures be taken to construct a double rail road between the city of Baltimore and some suitable point on the Ohio river, by the most eligible and direct route, and that a charter to incorporate a company to execute this work be obtained as early as possible ; and in support of this opinion, they submit the following views and statements."

Among these statements, which are all from books and pamphlets in common circulation, is the following:

"The proprietors of the *few* canals which do answer will have the greatest reason to complain, (that is, of the introduction of rail roads;) but they must, of course, submit to any superior method of improving the conveyance or transport of merchandise, just as the common coasting traders will to the established steam vessels; with respect to those canals which do not answer, and those that never can, the sooner they are abolished in toto the better." (Gray, p. 66.)

"The expense of forming railways is not only far less than that of canals, but the former exhibit the peculiar advantage of a better conveyance than roads and canals conjointly afford at present." (Gray, p. 67.)

"The mode of conveyance that most nearly assimilates to railways is canals; but to them, *the agency of steam cannot be available,* as they are *limited to the size of their loads*, and, as regards utility, to the speed of conveyance; for to draw a load of forty or fifty tons with double the speed that is now done by one horse, could not be effected on a *common canal* by any power that can be applied." (Jessop in Gray, p. 103.)

A railway can, according to circumstances, be made at from a half to a *fourth of the expense of a canal*, and convey goods more cheaply, which would render them lucrative when any other mode would be ruinous." (Idem in Gray, p. 104.)

"Railways may be constructed at *one-fifth of the expense of canals;* and as it has been shown that they will convey as cheaply, where the prospect of remuneration to the adventurer in one case is doubtful, the *lesser expense* makes the other *certain.*"

Whether these essayists merited all the confidence reposed in them, experience has already determined, in the relative cost of the construction of a considerable part of that very canal, denounced as affording too tardy, circuitous, and *expensive* a route to the Ohio, and to the *actual cost* of a correspondent part of a rail road from Baltimore towards the "Point of Rocks," —a canal exceeding greatly, in dimensions, as well as in the difficulty of its construction, any canal in England, and surpassed in breadth, by but one in Great Britain, compared with a rail road of two tracks only.

At the moment of the publication of this pamphlet, it had been ascertained that the rail road between Manchester and Liverpool, of four tracks, in length but thirty-two miles, and surmounting an elevation of less than 150 feet, would exceed in cost sixty thousand dollars a mile! Its actual cost will much surpass, it is currently rumored, the double of that sum.

That the cost of the Ohio canals has not exceeded 11,000 dollars per mile has already been noticed, as well as the computed cost of the Erie canal of New-York, which has, in fact, cost less than 18,000 dollars the mile; its price having been made to reach 23,000 dollars by the addition of interest on loans: and which have no relation to the contract prices of the works of a canal, and depend for their necessity and their terms on the wealth or credit of the borrower.

The conclusion, that permanent rail roads, of several tracks, cannot be constructed at one-fifth of the expense of canals, may be farther confirmed by reference to the cost of the canals of Pennsylvania, New Jersey, and Connecticut. The eastern section of the Chesapeake and Ohio canal is expected to cost from 25 to 27,000 dollars the mile; but a canal of such dimensions should be compared with no railway of less than four tracks; and the rails alone of such a road would probably cost more than that sum, exclusive of the graduation of the road.

M.

Extract from the report of the Board of Managers of the Lehigh Coal and Navigation Company, presented to the stockholders on the 12th of January, 1829.

"The rail road continues an effective auxiliary to the business of the company, and being located upon a plane descending in the direction of the load, and, requiring no expensive or complicated machinery in its use, ap-

proximates in facility of transit to a small canal; and, whenever an enlarged business shall require the construction of another track, the peculiar advantages presenting for its location will insure its effects to be fully commensurate with the most extended prospects of trade. The report of the engineer will exhibit the progress of the improvements on the Lehigh, and what still remains to be done; from which it will appear, that the whole can be completed in the early part of next season; and will then furnish a navigation from Mauch Chunk to Easton, made up of thirty-seven miles of canal and ten miles of slack water pools, having five feet depth of water, and a well constructed towing path the whole distance. The canals are sixty feet in width on the top water line, with locks twenty-two feet wide and one hundred feet long, and fed, at eight separate points, by substantial dams across the river. These, besides furnishing an ample supply of water for all the purposes of navigation, will also afford important water power in advantageous positions, especially the one at Easton, which has already begun even to attract the attention of manufacturers."

To the report from which the preceding extract has been made, is appended the following report of the acting manager, Josiah White:

"That the rail road to the company's mines, notwithstanding it was put up in such an expeditious manner, and was the first made of such a magnitude in our country, continues to answer the desired purpose, although it has been subject to some modifications and alterations. Since we have reduced the velocity of travelling, from *twelve to fifteen miles* an hour, down to *five and seven miles an hour*, our horses and mules, which in the former rate got and kept sick, in the latter, continue healthy, notwithstanding their regular daily work is thirty-five to forty-five miles per day; and so strong is their attachment to riding down, that, in one instance, when they were sent up with the coal wagons, without their mule wagons, the hands could not drive them down, and were under the necessity of drawing up their wagons for the animals to ride in.

We have made, during the past year, forty four coal wagons, and thirteen mule wagons, each to hold three or four mules.

We have brought from the mines 33,150 tons of coal, of which 30,111 tons have been shipped.

We have built thirteen and a half miles in length of coal boats, and procured the following lumber for boats, viz:

Sawed lumber, - - - - -	2,972,215 feet.
In logs, - - - - - -	1,000,000
We have also procured for the navigation from above Mauch Chunk, of sawed lumber, - -	2,581,783
And in logs, from above do. - - -	1,908,129
And from below do. - - -	2,600,000
Total quantity of lumber procured the past year,	11,062,127
Sawed lumber on hand at Mauch Chunk and Pine Forest,	1,171,000
Logs on hand at Pine Forest, - - -	1,300

During the past year, we have erected a lodging house for the tavern, two stories high, thirty by one hundred feet; it is pebble dashed, and contains thirty-seven rooms of convenient size. We have erected at the mines a dwelling house for the superintendent, and a school house for that settlement. We have also explored the district in the vicinity of the great coal mine, and fixed upon a central situation whereon to erect a steam engine, for the purpose of drawing up the wagons loaded with coal, to the sum-

mit of the rail road, from whence they will descend by their own gravity to Mauch Chunk. From this engine station, a convenient connexion can be made with the point to which the wagons will also run by gravity, not only out of the great coal mine already opened, but also from those which may hereafter be opened within a range of two miles.

I have the further satisfaction to add, that our examinations for discovering where the coal approached near enough to the surface, so as to quarry it in our usual way, that there is abundance of coal sufficiently near the surface for this purpose, at the present summit, from whence it will descend from the quarry to Mauch Chunk, by gravity alone.

It is with heartfelt satisfaction that I view the prospect of finishing the ascending navigation this season; which I expect will be realised, without a doubt, and thus put an end to the demands of the coal business on the forest, as a necessary part of its existence.

Perhaps some remarks on our experience with our rail road, on which has been transported upwards of 60,000 tons, may settle the question with some of our stockholders, who have doubted the policy of canalling the valley of the Lehigh, in place of making a rail road. I, therefore, now give the cost of transportation on our rail road, and also on the Erie canal. Data for the latter I obtained from the superintendent of the east division of the Erie canal, and also from a gentleman largely engaged, for three years, in the making of hydraulic lime or cement, and transporting it on one hundred and fifty-two miles of this canal. Both are given without tolls, or repairs of road or canal.

Cost of transportation on our rail road, for the year 1828.

Mules and horses cost	- -	1 1–3	cent per ton per mile.
Hands - - - -		1 1–3	do. do.
Repairing wagons - - -		2–3	do. do.
Oil for ditto - - -		1–5	do. do.
Total - - - -		3 53-00	do. per ton a mile,

full and one way, and the whole cost divided into the distance one way only.

Cost of transportation on the Erie canal.

For boats of forty tons burthen, one cent per ton a mile: full loads one way, and returning empty. Calculated as per the rail road.

Calculating on same data as above, on a boat of sixty-seven tons, such as will be adapted to the Delaware canal, will cost seven-tenths of a cent per ton a mile: and for a boat of one hundred and thirty-four tons burthen, adapted to the Lehigh canal, one-half cent per ton a mile; the latter being less than one-sixth the cost per mile, as per our rail road, notwithstanding the favorable circumstances attending that rail road.

A rail road, well made, is attended with little expense for repairs and decay at first; but all its essential parts begin, though slightly, to decay at its existence, and its decay gradually increases to its final annihilation.

A canal is attended with expensive breaches, &c. in the first instance, but every repair makes the work better; and most of its constituent parts are as durable as time.

Our canal, it is believed by our engineer, will be passable by the seventh month (July) next. It is calculated for boats of one hundred and thirty to one hundred and fifty tons burthen. All the locks, aqueducts, culverts, &c. are laid in hydraulic lime The ponds connecting the canal are cleared out in the channel fifty feet in width, and five feet deep: and all the tow paths along them are faced with a permanent slope wall In the whole line, I know of no part on which money is expended for ornament; but, inasmuch as we were sure of a large transportation on it, money has been expended to make it substantial, that might have been avoided, if the desire had been more to come within the original estimate of the engineer, than to have made a substantial and permanent work.

In the dryest weather of last autumn, our engineer, Canvas White, was on the summit between the Nescopeck and Lehigh, and at the Lehigh, where it was proposed to take the water out for the supply of the canal to Nescopeck and the Susquehannah; and his opinion was given, that there is an abundant supply of water for the summit; and, since then, Mr Robinson, a skilful engineer, appointed by the State commissioners to examine those grounds, for a canal or rail road from the head waters of Schuylkill and Lehigh, or Broadhead creek, to the river Susquehannah, has examined those grounds; and I learn that the result of his examination is, that, of all the lines proposed, *there is but one* adapted for a canal navigation, and that one is by the Nescopeck to the Lehigh; and here, by resorting to a tunnel of only one hundred and seventy-five poles in length, and a dam only ten to thirteen feet in height across the Lehigh, at the mouth of Bear creek, the river Lehigh will flow into the summit. When it is recollected that this is the *only* line for a water communication north of the Blue mountains, that can connect the Susquehannah with the Delaware and Philadelphia, and that the produce of the *west branch* of the Susquehannah can get as cheaply this way as any other, and *all* on the north branch of the Susquehannah, cheaper to Philadelphia, and thus be tributary to the Lehigh canal, and the Delaware division of the State canal, the stockholders of this company, and the public at large, will know ere long how to appreciate it. The Nescopeck and Lehigh canal is calculated to correspond with the Delaware section, for boats of sixty-seven tons burthen, *and will cost for transportation from Berwick to Mauch Chunk*, from the best data I can get, *about one-third as much per ton a mile as on our rail road;* this, added to the advantages of a *continuous voyage in the same boat*, and with the *same superintending hands*, (and *no trans-shipment*) from the extreme ends of the Susquehannah canal to Philadelphia, will, I presume, settle public opinion on the manner of passing the ridge of land between the waters of the Susquehannah and the Delaware.

All which is respectfully submitted,

JOSIAH WHITE, *Acting Manager.*

Philadelphia, 1st mo. 12th, 1829."

Extracts from the report of the Board of Managers of the Lehigh Coal and Navigation Company, for the year 1830, *and the Acting Manager's report.*

"The length of our line of improvement is 46¾ miles, and has cost, including the whole of the river improvement, from its commencement as a descending navigation, to its final completion, about $1,558,000; the distance being divided into 36¾ miles of canal, and 10 miles of pools, with a tow path throughout the line."

From the Acting Manager's report of the last year.

"We have made some very satisfactory alterations in the railway, for the purpose of preventing the early decay of the timber, and jolting of the wagons. We now run the wagons at the average rate of about six miles an hour, and find this motion produces much less wear, both of the wagons and road, than a greater velocity. I have demonstrated to my satisfaction, that the wear and tear of the road and wagons is in proportion to the motion; and that, in the end, a motion exceeding twenty miles an hour (which we tried in the first months of our business) will make the transportation on rail roads more expensive than on our graded turnpike, on which the rails were laid."

In addition to the information derived from the published documents and reports of the Lehigh Coal and Navigation Company, it is deemed proper to insert in this note the following essay in the Mauch Chunk Courier, just received, from the pen of the highly respectable superintendent of that work, sustaining the views of the comparative advantages of rail roads and canals which his official duty had prompted him to communicate to those in whose service he has long been engaged: and whose confidence he is known to have possessed in an eminent degree.

From the Lehigh Pioneer and Mauch Chunk Courier.

To the Editor of the Mauch Chunk Courier.

A friend handed me, a day or two since, the "Paterson (N. J.) Intelligencer," dated 7th April, and called my attention to a long article, signed by John I. Sullivan, civil engineer, wherein I am made to appear the enemy of the public improvements now going on in our country. It would be a poor compliment to human nature for me to change at this time of day, after twenty years personal devotion to works of a public nature, and twice jeopardising my whole estate in promoting those improvements, and now take a contrary course.

We began our rail road early in January, 1827, and finished it in May following. Up to this time, we transported on it more than 100,000 tons. Its entire length is nine miles, single tracks; its branches at the ends and sidelings, four miles more. The elevation of the road, from the head of the chute to the summit, is 767 feet, in a distance of eight miles, being an average of ninety-six feet to the mile. We have not had a week's interruption from casualty since it was finished; so that it may be called a practical road from its completion. The first two months' use of the road, our wagons moved fifteen and twenty miles an hour, as the men who had charge of their descent were anxious to get through the route as soon as possible, to avoid the fatigue of holding them in check by the breaks. We soon perceived our utter inability to keep the wagons repaired without reducing the speed, or be subject to cost and repairs greater than the gains made over the good turnpike we had abandoned; besides, the tremulous motion occasioned by the wagons going at those rapid rates ground the corners of the coal into powder, which enveloped the driver in a continual cloud of dust.

Our rail road was new when we travelled at the high speed, and, although not so perfect as it might have been made, I presume it was as evenly made as those which are made more perfect in other respects, in the first instance, would be, after one year's wear and tear from 100,000 tons per year going on them, at the rate of 15 a 20 miles an hour. Thirty years ago, the rail roads in England, and until very lately, had their flanges on the track of

the road, or most of them in that way ; and as a consequence, were always liable to be covered with dust, dirt, &c.; ours is of the modern construction, and we have adapted it to ride the horses down, so that they perform two ordinary days work in each day. The only difference between our road and the most modern one in England, is, that their work is put together more evenly and stronger, to carry their locomotive engines, which weigh two or more times as much as passes on our road. Our road is graded so as to have such a continued descent from the summit down, as for the wagons to descend on all parts of it by gravity. When they began to pursue this mode in England, I know not: ours was the first of the kind we had any knowledge of, and the English have not improved on it.

I am too good a republican to fear responsibility when I see my way clear. I should suppose the men of science in England would be governed in their knowledge of facts, the same as in other places. It is but a thing of yesterday, they had any knowledge of wagons going at the rate of twenty to thirty miles an hour; and they have no experience to test the consequences: to get these motions has caused them unusual efforts. The case was different with us: we had a difficulty to go slow ; and we thought we had exploded the economy of a rapid motion before the English began theirs. I believe that if a rail road was made perfectly even, and could be kept so, that the wear and tear would be very different from what is the every day's experience. I am so unaccustomed to see perfect articles, that I sometimes doubt of their being such, and hardly to be expected on the track of long roads, exposed to all kinds of weather and casualties. I have never noticed a long bar of wrought or cast iron of an even degree of hardness, the whole length on all its sides.

I had an interest in a wire factory at the falls of Schuylkill, which made half a ton of wire per day—we cut the bars into five to eight pieces, (and our iron was the best we could select,) and it was a very rare thing to find the bars so evenly tempered as to bear reducing this small quantity without breaking, and generally in several places.

With the utmost skill and experience of our mechanics, we do not find them to bore a steam engine cylinder perfect ; the pistons all require packing, to prevent the escape of steam. I never noticed a wheel cast perfectly true ; we cast ours in (turned) but they do not come out perfectly correct ; and if they were cast or turned true, it is as difficult to wedge them on perfectly correct; so difficult is the attainment of perfection on this side the grave. With these difficulties before us, I will take it for granted, the wheel of the cars is 1-16th of an inch out of truth, and that they are three feet in diameter: to go thirty miles an hour, would require them to revolve 278 times per minute, and the wagon and load weighing four tons, is one ton to each wheel: each wheel of the car strikes the road with a weight of one ton 273 times a minute, faster, I presume, than any man can count: besides this evil, the materials which compose the heaviest item of expense are of a perishable nature, whether used or not, and wear and tear proportioned to use. These are some of the reasons why I believe a road will not be made perfect ; and if so made, will not last interminably long, like the materials in a canal.

I am asked if I could, on my experience, check the spirit of investigation and enterprise that is abroad in the country. I answer certainly not the former, but as to the latter, I think it only valuable when governed by prudence, and then only it is invaluable. I recol

lect very well when the coal trade, and even the making inland navigation in our country, was in disgrace in the eye of the public; but neither is so now. The public is now extra hot in the same degree as it was extra cold formerly. The coal trade is now large, as well as respectable, in the opinion of the public; but there are no doubt ten times as many in the trade, as many canals and rail roads talked of to transport coal to market as there are markets for the article. Can this, then, be an enterprise wanting a spur; or what can the numerous canals and rail roads contemplated be worth if made? A canal has two advantages over a rail road, besides the economy of using. Their number of sites are known, and they are limited by water; and if they are made faster than the wants of the country, occasioned by a feverish state of the public mind, or by an error of judgment, they do not decay whether used or not, except the lock gates and wood work, of which there is very little since hydraulic lime has been brought into use. I believe that a rail road can be made strong, solid, and true enough, to not only admit of a speed upon it of six miles an hour, but even sixty miles an hour, for a short time; but I do not believe there will be economy in going more than six miles an hour with heavy loads, unless it is with passengers, valuable goods, &c. which will bear heavy tolls. Our company have no reason to dislike rail roads—ours has undoubtedly saved 50,000 already; but, by our canal, we now go an equal distance at one-fourth the cost of the rail road. But a canal cannot be made to the mines, so we resort to the next best thing.

J. L. Sulivan says, "The Stockton and Darlington road is certainly kept in the best repair, and is the best constructed rail road now in operation in England. Cast rails have been tried, but malleable rails are principally used, and decidedly preferred by the proprietors."

This road has been made about five years, and since that time they have condemned the old plan. But what say they of the best English road in October last? The London Mechanics' Magazine, of Oct. 1829, page 141, has the succeeding observations: "The speed of the engines has been increased on the Darlington road, by substituting wheels of four feet diameter instead of three feet; but these, working on the plane bars, cannot be case-hardened, for fear they would turn round when they have a hard pull; consequently, they are made of soft iron, which, from the immense weight of the engine, wears them in grooves the width of the rail, and twists them sideways, which keeps men incessantly on the line setting them straight."

So we find thirty years' experience is condemned, and all that we now have, worthy of our notice, are the experiments of a few days or hours, and these are leading brother Jonathan by the nose. Thus much for the best rail road in England. But still I *allow* they may make them stronger, although not so as to prevent those effects in a greater or less degree, if a speedy motion is resorted to, particularly with a locomotive engine, as the stress necessary to pull the load, impinges through the wheels on the road, and thus the joints of the road are pulled together between the wheels of the engine and the cars, so as to keep up an incessant action in the rails. J. L. S. gives us credit for constructing our rail road at $1,500 per mile; no one has the company's authority for this; our statement was $3,050 a mile, and most of it was laid on an old turnpike and single track.

The Manchester and Liverpool rail road is not a fair comparison for other rail roads; neither is the Novelty engine justly cited as a standard by which others are to be judged. The quantity of valuable merchandise passing between the two towns is said to be 1,200 tons daily; and the passengers

only, it is supposed, will produce $111,112 per year. The whole length of this road is but 32 miles and a half. They can, therefore, afford to construct it in a manner approaching as nearly to perfection as possible. The Novelty has had but a limited trial; our last accounts made it amount to a period of about six hours. It would hardly be prudent to invest millions on a thing that was not as durable as Jonah's gourd. It may do well: it is a neat affair enough; but it would be safer to wait a year or more before we pronounce it entitled to full faith, or consider it of such amazing utility, with no other data for our decision than the result of six hours' experimenting. Its boiler carries but 36 gallons of water, which is the main cause of its lightness. To produce the requisite steam, the evaporation must run rapidly from this 35 gallons of water; and if the supply pump does not correspond with the making of the steam for a few moments, a blow up is the inevitable consequence.

To compare rail roads and canals by dollars and cents, as far as we have practice and experience for our guide, will, no doubt, be coming nearer the point the public desire to attain. And whether it is gratifying to some or not, we, I trust, will all find that economy in the use of the improvements resorted to is the one thing needful, in which the public at large is most interested in having accomplished.

The annexed calculation is estimated from the cost, &c. of the Mauch Chunk road. But that part of it only from the summit of Mauch Chunk, being eight miles, descending the entire distance, and the whole owned by a single company, (so that we are exempt from the interference of neighbors,) it is presumed that it can compare in its use with the minimum cost of a first-rate rail road under the most favorable circumstances

Estimate of the repairing, &c. of the perishable part of the rail road with double tracks.

For one mile 20 tons plate iron, cost for iron, and laying down	$2,000;	
last, say 20 years - - - - - -		$100 00
Wood for rails and sills, 126,720 feet, at $15,	$1,900 80	
Carpenter's work, say - - - -	1,900 60	
	$3,801 60	
$3,801 60 last six years ÷ 6 =		633 66
One man repairing road to each mile 250 days - - -		250 00
Cost of repairing one mile per year - - -		$983 66

If the transportation be 100,000 tons, it is, say one cent per mile; and the repairs increase with the increase in the use of the road.

Wear and tear, or renewing of the rail road wagons, they lasting four years.

42 wagons (load a boat) cost - - - - - -	$4,200
7 mule wagons - - - - - - - -	350
	4,550

Last four years is $1137 50 per year.

225 days in the season, and 32 cwt. each wagon going two trips a day, is 134 tons, 8 cwt. a day, or 30,240 tons a year ÷ 1,137 50 = 3.76 ÷ 9 = 42.100.

Making daily repairs to wagons, three hands, 225 days - -	$ 675
Materials for repairs - - - - - -	1,350
Annual cost of current repairs - - - - -	2,025

2,025÷0 miles=$225÷30,240 tons is per ton a mile, 74-100 of a cent.
Total repair of wagons 1 16-100 cent per ton a mile.

Cost of hands and animal power from the summit to the end of the road, descending all the way.

28 mules go two trips a day, and draw up 42 coal and 7 mule wagons (to carry down the mules) each trip, &c. going 32 miles a day, the 42 wagons each carry 32 cwt. coal each trip. Total 134 tons.

28 mules, at 33 cents a day - - -	$9	24
4 drivers, 90 do - - - -	3	60
12	84	

÷134=10 cts.
for 8 miles, or 1¼ cents a ton a mile.

This 1¼ cents a ton a mile is the *nett cost*, without any contingencies; the cost last year was 17½ cents for 8 miles, being say 2 cents. The difference between the two was made up of the superintendent of the rail road, hands assisting to provide for the animals, lost time through the season, keeping animals in the winter, &c. making the *whole* cost, at a close estimate, 4 16-100 cents a ton a mile, exclusive of interest account and grease.

Canal estimates of transportation and repairs of canal.

The boat carrying 75 tons makes a trip loaded, down to Easton, 46 miles, and returns empty in 4½ days.

3 men at 90 cents.	=270×4½ days=	12 15
2 horses and rope, 85 cts.	=170×4½ days=	7 65
Boat, 70 cents a day	4½ days=	3 15
(Boat cost $700, and last 1000 days)		22 95

$22 95÷75 ton=30 60-100÷46 miles=a ton a mile 66½-100.

Wear and tear of the canal.

The lockage from Mauch Chunk to Bristol, in tide, is 524 feet, which, 8 feet lifts, is 66 locks, distance 106 miles; 66 locks will require their gates renewed every 10 years, and the cost of a set of gates, say $500×66=$33,000÷10 for their duration, is per year

$3,300÷106 miles. per mile - - - -	$31 12
52 hands, 250 days, being 1 hand to 2 miles, repairing, (after 8 years duration) is, a mile - - - - - -	125 00
	156 13

100,000 tons÷$156 13-100=1½ miles, or 15-100 a mile, which, added to 62½-100, makes the total cost of transportation by canal, including wear and tear of canal, $1½-100 cents a ton per mile, exclusive of interest.

Our present cost of transportation on our canal, in *rough arks*, is, per ton per mile, - - - - - - - - 1 cent
To which add the wear and tear of canal, as above, do do 15-100

Total cost, *at present*, per mile, per ton, - - - 1 15-100

Hence, it appears that our canal, used in the ordinary way, will cost less than one-fourth of a first rate rail road.

It may be observed, that I have not noticed the cost of lock gate keepers; this was omitted, because the water power passing from one level to the other to keep them up, will produce a revenue greater than their pay.

There are too items, not heretofore taken in account, that will lessen the cost of transportation on the canal, where there is plenty of water as in the Lehigh and Delaware, viz: one is, that, as *the freight is mostly downwards, half the power may be saved by letting a current pass down the canal;* the other is, that, *by using propellers,* and having two locks at each lift, one for ascending and the other descending, *we can save all the animal power by substituting water power,* and one-third of the hands, thus reducing the cost of transportation about one half. Our rail road friends must allow us to avail ourselves of improvement in canals, if they take that course in rail roads. But, in making my estimates, I have endeavored to consider what expenses *have occurred,* rather than what *may* occur; for many of our supposed improvements ofttimes prove injurious, rather than beneficial, to those who have been at the trouble and expense of making them.

5th mo. 20, 1830. JOSIAH WHITE.

The following are extracts from letters of Mr. White, to a distant correspondent:

"MAUCH CHUNK, *3d mo. 5th,* 1830.

"Rail roads are a great improvement on turnpikes; but, in my opinion, are vastly inferior (particularly as a public work, and in a republican country) to canals, both as to conveniences as well as economy. A canal is accessible everywhere, a rail road nowhere, (without interrupting the current of wagons,) except by an arrangement for turning out; and the more turn outs are made, the greater the casualties. By canal, every boatman may choose his own motion, within the maximum motion; by rail road, every traveller must have the same motion, or be subject to turn outs; which, as I have said, have their casualties. The motion of twenty and thirty miles an hour on rail roads will be fatal to wagons, road, and loading, as well as human life.

"We have a distance of eight miles from the mines, with a descent of seventy to one hundred and twelve feet in a mile. The velocity of the wagons would exceed thirty miles an hour, if not checked. Our first two months' use of the road was fifteen and twenty miles an hour; which would have soon ruined both road and wagons, and, I am persuaded, was then dearer than the turnpike we put our rails on.

"Our present motion, say of six miles an hour, is very satisfactory; and makes the rail road an immensely valuable appendage to our coal business. Wet or dry, we go on it; moist and wet weather, which ruins turnpikes, makes the wagons run freer on the rail road; snow, however, is an impediment. Our wagons will not run down from the mines, by gravity, in a snow storm; the snow packs on the road. In such weather, as well as in sleety weather, we cannot use the break, as it slips too freely to produce the necessary friction to check the wagons.

"I think it rather fortunate for society, that rail roads are not of equal value to canals, for a rail road can be taken any where; and, consequently, no improvements would be safe on their line: for the moment the improvement succeeded, it would be rivaled, so as to destroy both, &c.: whereas we know the line and limit of our canals, by the supply of water, and graduation of the ground; so that all improvements thereon are safe against the undermining of rivals. I should consider, that, if the rail roads superseded canals, they would, for the above reasons, render the tenure or value of property as insecure as it would be if without the protection of law."

"MAUCH CHUNK, *3d mo. 25th*, 1830.

"Thee, no doubt, has observed the last accounts of the "Novelty" locomotive engine on the Manchester and Liverpool railway, stating that the fuel (at ten shillings sterling a ton for coke) cost but thirty-seven shillings sterling, to carry a ton of goods round the world; and that the owners offer to make engines to weigh five tons, and draw one hundred tons, that shall not consume more than about one-third of a mill, our money, a ton a mile. This, no doubt, will be received as a well settled experiment in favor of rail roads, and against canals.

"I suggest, if this engine is of the superior order represented, that it is *equally adapted to canals*, by having a less power, and proportioning it to the load it has to draw. Our canal can carry boats of one hundred and forty and one hundred and fifty tons. Our State canals generally carry boats of seventy-five tons. This power can be applied as advantageously on the canals as on the rail roads, by having light rails on one or both sides of the canal for the wheels, which drive or draw the boat to run on, and keeping the engine on the boat: by which means, the engine will, no doubt, be made to last three times as long as if on a rail road, from the incessant jarring of the latter. Thee will perceive, by the tables in the books on the subject of rail roads, that, at two and a half miles an hour, the effect from the same weight is 55,500 pounds by canal, and 14,400 pounds by a level railway; so that the same engine would propel three and a half times as much on a canal as on a rail road, and, of course, save two-thirds the fuel, and the same proportion nearly of the power of the engine, in addition to its increased durability.

With regard to engines on rail roads, moving with equal weight with indefinite velocity, it is proved by us, and on the Liverpool railway, to be a false theory; the motion invariably was reduced by adding to the weight to be pulled; and the wear and tear, no doubt, is as the velocity, the weights being equal.

The opinion entertained by the Baltimore and Ohio Rail Road Company of this railway, deserves a place in this note, and is supplied by the following report of a highly respectable committee of their body, after a tour of inspection in the United States.

"*Report of the committee appointed by the Baltimore and Ohio Rail Road Company to examine the Mauch Chunk and Quincy rail roads.*

"BALTIMORE, *June 12th*, 1827.

"The committee appointed to visit and examine the rail roads at Mauch Chunk and at Quincy, and to collect such additional information as they might be enabled to obtain, by consulting scientific and experienced individuals, who have had an opportunity of inspecting this description of roads in Europe, report, that they have, as far as has been practicable, performed the duty assigned them.

"The committee, in the first instance, proceeded to Mauch Chunk, and examined the road lately constructed at that place, the length of which is nine miles. It extends the whole distance along the side of a mountain, down an inclined plane of various declivities, according to the situation of the ground over which it passes.

"The elevation of the coal mine at Mauch Chunk, above the Lehigh river, at the point where the coal is delivered into boats, is 936 feet. From this mine, the road, as it approaches towards the river, rises within the distance of about half a mile forty six feet, when it reaches the extreme point of its elevation, which is 982 feet above the water; the distance from this place to the river is about eight and a half miles; the road then constantly descends, by an irregular declivity, as follows, to wit:

At 8	miles	from	the	river,	its	elevation is	943 feet—descent	- 39
At 7	"	"	"	"		844 "	"	- 99
At 6	"	"	"	"		735 "	"	- 109
At 5	"	"	"	"		633 "	"	- 102
At 4	"	"	"	"		538 "	"	- 95
At 3	"	"	"	"		439 "	"	- 99
At 2	"	"	"	"		359 "	"	- 110

"There is at the bank of the river an abrupt termination of the mountain, upon which is constructed an inclined plane, 700 yards long, with a declivity of 225 feet, below which there is still a further descent of twenty-five feet down a chute, through which the coal is conveyed into boats on the water, the actual descent, from the point of the road, at two miles distance from the river to its termination at the top of this inclined plane, is, therefore, in a distance of about a mile and five-eighths, 109 feet.

"The whole of the Mauch Chunk rail road, extending a distance of nine miles, and including the inclined plane of 700 yards, was constructed in two months and three days from the time of its commencement, and was within that period so far completed, that wagons have since regularly passed upon it; there are, however, a few laborers still employed in finishing some parts of the work not yet entirely completed. The cost, including the 700 yards of inclined plane, is stated to be between $2,500 and $3,000 per mile.

"The road is principally laid upon the track heretofore used by the Mauch Chunk Company, for the transportation of coal, on wagons of the common construction. The sleepers, which are of wood, are laid four feet apart, upon a stone foundation; the rails, which are also of wood, are then placed upon these sleepers, and are fastened to them by wooden keys; they are afterwards plated on the inner edges with rolled iron bars, from two-eighths to three-eighths of an inch thick, and from one and a fourth to one and three-fourth inches wide, and the space between them is filled up with earth or gravel, so high as to cover the sleepers, and to form a horse path, which completes the whole labor.

"There are various crossing places along the course of the road, and several turns out, both of which are easily effected at a very small expense. There are also many considerable curvatures in the road along the side of the mountain, to suit the localities of the ground; and these sinuosities are effected with the greatest facility, by simply elevating the rail on the outer curve a little higher than the rail on the inner curve, which gives a ready direction to the wagons in their passage, without any other result than lessening their velocity, which is retarded at these points, by the increased lateral friction of the wheels. The wagons here used weigh from 1,200 to 1,500 pounds each, and are kept on the rails by flange wheels. Their construction is precisely similar to those represented in the books of Strickland, Wood, and Tredgold.

"The committee, after a careful examination of this work, do not hesitate to state to the Board, that it is on so simple a plan that mechanics of

ordinary skill would be fully competent to the construction of one similar and in every respect equal to it; at the same time, it appears to be extremely well adapted to the object for which it was intended. The loaded wagons each carry one and a half tons of coal, and descend in brigades of six, eight, or ten, connected together by iron chains, each brigade being attended by two men. These wagons descend from the summit level to the top of the inclined plane at the river, a distance of eight miles, in thirty minutes, exclusive of a few minutes consumed in greasing the wheels on the route.

"On arriving at the inclined plane, the loaded wagons are let down, one at a time, by a rope, worked upon a horizontal shaft, which is regulated by a powerful break; and each loaded wagon, as it descends, draws up an empty one. In this manner, they pass a loaded wagon down, and an empty wagon up the inclined plane, each travelling a distance of 700 yards in forty five seconds, which is at the rate of thirty-two miles an hour, and the operation seems to be performed with great ease and safety.

"The empty wagons are returned to the coal mine by horses, each horse drawing from three to four of them up in three hours, that is, at the rate of three miles an hour; and each wagon weighing from 1,200 to 1,500—the average acclivity of the road, including the whole distance from the top of the inclined plane, being about one degree.

"The committee were taken up the road by one horse, drawing an empty wagon, and two cars conveying fourteen persons, the whole weighing about two and a half tons, at the rate of four miles an hour, and they descended in the same cars, with the same persons, in forty five minutes, (exclusive of the time lost by detention, from meeting wagons returning to the mine.) Part of the time, the cars for short distances ran by their own gravity, at the rate of more than twenty miles an hour, and they ran one entire mile in three minutes and fifteen seconds, which is at the rate of eighteen miles an hour; on other parts of the road, where there are sharp turns, or but little descent, the speed of the cars was reduced to the rate of four, or even to three miles an hour."

"The committee, after a careful examination, as here stated, of the railways, both at Mauch Chunk and at Quincy, and after the conferences they have had an opportunity of holding with the proprietors of these establishments, and with a number of scientific gentlemen, whose opinions are entitled to great respect feel entirely satisfied that there will be no difficulty in constructing the proposed railway from the city of Baltimore to the Ohio river; nor have they the smallest doubt but that there is ample skill in our country for the execution of this part of the work; the committee are also further satisfied, that the necessary materials for its construction can be easily and conveniently obtained.

"Whilst, however, the committee feel no hesitation in thus confidently giving their opinion upon the practicability of constructing the road, they also feel it to be incumbent upon them to state their conviction to the Board, that, from the varied and undulating surface of the country over which a considerable portion of the road must necessarily pass, great labor, and the exercise of a sound and discriminating judgment, will be required, in order to fix upon the proper location of the route; and the committee also believe that much experience and science will be required to decide upon the most advantageous moving power to be employed upon it. The opinions, therefore, of able and competent engineers, of sufficient experience upon these two vitally important points, is indispensably necessary, before the company can safely venture to determine on the grade and final location of the road; and, after an extensive inquiry, and considerable communication with

several gentlemen of highly respectable character for intelligence and scientific attainments, the committee are of the opinion that a suitable deputation should proceed to Europe for the purpose of viewing the different rail roads now constructing or in operation there, and of consulting with experienced and practical men, in order that we may become distinctly informed of all the modern improvements *in the application of moving power upon them*, this being the only point of any difficulty, or upon which there is the least hazard of our falling into any important mistakes.

"In order to facilitate the inquiries of the proposed deputation, the committee deem it necessary that they be put in possession of a reconnoissance of the several practicable routes, all of which should be deliberately examined, and their respective advantages and disadvantages be duly weighed and considered, before a safe conclusion can be adopted relative to the amount or kind of power to be employed upon them, the fact being simply this. *that the power to be used must either be adapted to the profile of the road, or the road must be graded to suit the power to be employed;* and, in order that the deputation may be prepared to proceed as early as possible, the committee recommend that all practicable diligence be used to obtain these reconnoissances with as little delay as circumstances will admit of. All which is respectfully submitted.

"PHILIP E. THOMAS,
"ALEXANDER BROWN,
"THOMAS ELLICOTT."

In the sixteenth report of the Board of Public Works, to the General Assembly of Virginia, Mr. Crozet, the principal engineer of that Commonwealth, in his report to the Board, expresses himself as follows:

"From their acknowledged superiority in a great many instances in England, railways have obtained warm advocates in this country, though the opinion seems most generally to prevail that they are not applicable here. Without attempting to judge of what is expedient in other States, I am of opinion that, at least in Virginia, railways could not be extensively introduced."

The engineer then proceeds to consider the expediency of a rail road, as a substitute for the navigation of James river; and concludes (p. 491) with the following remarks in relation to a rail road across the mountains:

"The making of a railway across the mountains has been also mentioned; but it would there be attended with still greater practical difficulties.

"In the first place, the mountains are so rugged and broken, that the only practicable way to carry this plan into execution would be to follow the valley of some creek, which leads up to the top of the dividing ridge. But here, all the difficulties presented in the valley of James river would be greatly multiplied. The graduation of the road must be almost every where among cliffs; its windings would be more numerous and considerable; the deep cut would be enormously expensive, and the stationary engines and inclined planes very frequent, &c. After having, at an immense expense, established the foundation of the railway, blocks of stone must be obtained, shaped, and transported into a complete wilderness, and put into their place. Then castings must be obtained from a foundry at the rate of at least one hundred and twelve dollars per ton, and transported an immense distance to this same wilderness, to form a railway, perhaps one hundred miles in length, at the rate of nearly one hundred tons of iron per mile, exclusive of fixed steam engines and machinery.

"In England, where facilities of all sorts are concentrated, where there exists an extensive practical knowledge of these things, the nice adjustment of railways may not be thought an object capable of having a material influence on the expense; but, among the mountains of Virginia, far from foundries, rails would have to be procured of particular shapes to suit each of the numerous curves of the road, and counteract the centrifugal force of the wagons in the turns.

"What the expense of railways, made under circumstances so unfavorable, would be, I am not prepared to say; but certain it is, that it would be immense, and that the present state of things would not justify it."

N.

In two reports very recently made to the Liverpool and Manchester Rail Road Company, by two eminent civil engineers, who were empowered, prior to making their reports, to visit all the rail roads in use in England, for the collection of suitable materials to solve the inquiry propounded to them by the officers of that company, which was, by what means of transportation their rail road could be most effectually made to subserve its ends, the public convenience, and the profit of the stockholders? it is distinctly stated to be their opinion, that the commerce and intercourse between Liverpool and Manchester are not competent to maintain the cost of the application of *stationary* steam engines to that great thoroughfare, and that a greater velocity, than of ten miles per hour, ought not to be attempted by the locomotive engines, which they recommend as a less expensive propelling power, than the stationary. It was designed to incorporate, in this note, copious extracts from the reports of those engineers, which have, however, been somehow mislaid.

From an English work on rail roads, of prior date, and by far the most valuable now extant, that of Wood, the following extracts will show, that, in 1825, the date of the publication of his treatise, the question was not regarded to be settled as to the relative value of rail roads and canals. "Canals," says this writer, "ever since their adoption, have undergone little or no change; some trivial improvements may have been effected in the manner of passing boats from one level to another, but, in their general economy, they may have been said to remain stationary. Their nature almost prohibits the application of mechanical power to advantage, in the conveyance of goods upon them; and they have not, therefore, partaken of the benefits which other arts have derived from mechanical science.

"The reverse of this is the case with rail-roads; their nature admits of the almost unrestricted application of mechanical power upon them, and their utility has been correspondingly increased. No wonder, then, that canals, which at one time were unquestionably superior to rail roads in general economy, by remaining in a state of quiescence, should, at some period or other, be surpassed by the latter, which has been daily and progressively improving; and perhaps that time is arrived. The human mind is generally averse and slow in adapting itself to the changes of circumstances; and though from this cause the competition in consequence might not have been so speedily brought into action, had not the present prosperity of the country induced capitalists to seek out every source of speculation, affording the least prospect of success. The natural course of events would, however, soon have developed the real situation of the two modes, in their respective relations to each other; and though the time might have been prolonged when railways were brought into active competition with canals, yet its arrival would not be the less certain.

"One might be led to suppose, that the question could readily be solved by an appeal to facts, or by the comparison of particular canals with similar railways; but it is here, I presume, where the difficulty lies; we cannot perhaps find canals and railways whose external features are precisely the same; we are obliged, therefore, to have recourse to a comparison of general facts or principles peculiar to each mode, which again cannot be accomplished, unless we are fully and intimately acquainted with all the various properties and characteristics of each mode. The want of proper data was felt, and it is with a view of furnishing these, that the present work was undertaken; which, by a concise and at the same time comprehensive description of the construction, uses, and advantages of rail roads, together with an elucidation of the various principles of their action, the reader might be enabled to make a comparison with other modes of internal communication, and thus form a judgment of their relative value.

"It is much to be regretted that a similar inquiry has not been made with respect to canals; the present state of commerce requires that goods should be conveyed from place to place with the utmost rapidity, and perhaps we owe no small portion of mercantile prosperity to our facility of despatch. The slow, tardy, and interrupted transit by canal navigation must, therefore, of necessity yield to other modes affording a more rapid means of conveyance, (especially when their relative economy is the same,) unless they can be made to partake of the general activity, and additional celerity given to the boats conveyed upon them. Experiments, to ascertain the amount of resistance at different rates of speed, would be therefore highly valuable; and it is to be hoped that su h will be made on a practical scale upon some of the canals, to show how far they are capable of affording a more speedy transit."

"The existing agitation of the public mind, respecting the relative utility of rail roads and canals, in the transit of goods from one place to another, renders it a subject of proper inquiry to ascertain the relative performances of the different kinds of motive power upon those two species of internal communication.

"I shall, therefore, give a brief comparison, founded on the foregoing deductions of the different kinds of motive power upon rail roads, with the performance of horses by the present mode of canal navigation.

"Not having had an opportunity, from my own personal observations, of ascertaining, with sufficient accuracy, the weights which a horse will drag in a boat upon a canal, I shall be obliged to have recourse to the reports of those engineers whose practice in that line has enabled them to obtain the necessary data.

"Mr. R. Stevenson, of Edinburgh, in his report on the Edinburgh railway, in 1813, states, 'Upon the canals in England, a boat of thirty tons' burden is generally tracked by one horse, and navigated by two men and a boy; on a level railway it may be concluded that a good horse, managed by a man or lad, will work with eight tons; at this rate, the work performed on a railway by one man and a horse is more than in proportion of one-third of the work done upon the canal by three persons and a horse;' and Mr. Stevenson, in his calculations afterwards, assumes the power of a horse, upon a good railway, equal to ten tons.

"Mr. Sylvester, in his report on the Liverpool and Manchester railway, gives twenty tons as the performance of a horse upon a canal, travelling at the rate of two miles an hour.

"The variation between the two statements may have arisen from the observations being made on canals of different widths. Mr. Stevenson, in another report, states, that the striking difference between the draught of horses, on coming out of a narrow canal into a more capacious one, induced the reporter to give the subject particular attention; and, by means of experiments made with the dynamometer, so far as he had an opportunity of carrying the experiments into effect, the difference appeared to be at least one-fifth in favor of the great canal.

"Under these circumstances, I shall take the performance of a horse equal to that of thirty tons upon a canal, which is the greatest I have seen assigned by any one, and we have previously found the energy of his power equal to ten tons upon a railway: which will make the relative performances as 3 : 1.

"I am not acquainted with any experiments, made on a practical scale, to ascertain the ratio of the increase of resistance, either with different weights, or with the same load moved at different velocities, upon a canal; but it is assumed by all writers on the subject, as a law of hydrodynamics, which appears unquestionable, that the resistance at least is proportionate to the square of the velocity.

"Taking these premises as sufficiently established, the diagram III* will represent the resistances at different velocities; and the following table will show the relative quantity of work performed by horses dragging boats on canals, and carriages upon rail roads.

Velocity in miles per hour.	Weight conveyed in cwts.	Distance in miles, being that which a horse travels in a day.	Resistance upon a canal in lbs., taking a horse's power at 112 lbs., and supposing this force will drag a boat of 30 tons at two miles an hour.	Resistance upon a rail road in lbs, as per Table VIII.	Power which a horse can exert upon the load, at the respective velocities, from formula $\frac{224}{v}$.	Number of horses required to perform the work upon a canal.	Number of horses required to perform the work upon a rail way.	Ratio of the performance of horses, with respect to work on canals and rail roads.
2	800	20	150	448	112	1.3	4	4: 1.3
3	800	20	337	448	$74\frac{2}{3}$	4.5	6	6: 4.5
4	800	20	600	448	56	10.7	8	18: 10.7
5	800	20	937	448	$44\frac{4}{5}$	21.2	10	10: 21.2
6	800	20	1350	448	$37\frac{1}{3}$	36.	12	12: 36.

* III.

Velocities - - - - -	1	2	3	4
Spaces - - - - -	1	1	1	1
Times - - - - -	1	1	1	1
Resistance - - - -	1	4	9	16
Mechanical force required, acting for the above time - -	1	8	27	64
Mechanical force required, for any given distance - -	1	4	9	16

"From this we find, that, when the rate of speed is about two miles an hour, the quantity of goods which a horse will convey upon a canal is three times that which the same horse can convey upon a rail road; and that, when the velocity on each is about 3½ miles an hour, the resistance of the canal increasing as the square of the velocity while that on a rail road remain the same, the two become equal; and a horse is then enabled to drag as much weight upon a carriage on a rail road, as in a boat on a canal. When the velocity is further augmented, then the disproportion become greater, and a much heavier load can be conveyed on a rail road, with the same intensity of motive power, than can be done on a canal.

"If, therefore, the rate of tonnage on a canal, arising from the cost of forming and keeping in a state of active use, together with the cost of boats, be not greater than the tonnage required to form and keep a rail road in repair, and also the carriages by which the goods are conveyed; then the relative economy at different rates of speed, in the transit of goods upon canals and rail roads, will be represented by column nine of the preceding table. But as, in general, the formation of a canal costs about three times as much as the formation of a railway, and the annual charges of keeping the boats, towing paths, and bridges, &c. in repair, is also considerable, if those expenses be as much greater with a canal than upon a rail road, so that they will compensate for the extra advantage of the canal in the greater quantity of goods conveyed at a slow rate, then their relative utility will assume a different appearance, and the railway, as requiring a less investment of capital, and less annual charges, may be superior even at the lowest and most advantageous rate of motion upon canals; and, where facility or expedition is an object, then at the more rapid rates of speed the railway will be proportionably superior.

"These, however, being matters of calculation, where every instance may present a different conclusion, and depending upon all the various concomitant circumstances incident to each particular case, cannot, in a work like this, be made the subject of *even conjecture*. I have endeavored to furnish all those data which appeared general, and which applied to the two modes in conjunction with each other, in a practical and general point of view. It must be left to those acquainted with all the circumstances of each particular case, when they come into competition with each other, to judge, *from the individual situations, which of the two is preferable.*

"When it becomes a subject of discussion, which of the two modes are to be adopted, it assumes rather a different shape than when a rail road is to enter into competition with a canal already formed. *In the latter case, the canal proprietor commences with considerable advantage by the additional quantity of goods which a horse can drag at a slow pace upon a canal, where perhaps a little loss of time may be no object;* the canal proprietor may, *even with his great investment of capital, by reducing his rates of tonnage extremely low, be enabled to compete successfully with a railway.*

" For although a horse may, when travelling at the rate of four or six miles an hour, convey a greater quantity of goods upon a railway than when employed in dragging goods at the same velocity upon a canal, yet still a horse cannot drag more goods at the rate of four miles an hour upon a railway, than he can at two miles an hour upon a canal; for in no case does the greatest quantity of work that a horse can do, at the most benefi-

cial pace on a canal, *reach below three times that,* which a horse can do, at any pace upon a rail road.

"For the conveyance of passengers, or where the transit of any species of goods may require a celerity of four miles an hour, then railways become unquestionably more economical than canals; but *if the question be the abstract performance,* or *quantity of goods to be transported* from one place to another *without reference to speed,* then *the canals will at all times have a superiority over rail roads,* in point of *quantity of work* done by a horse, in the proportion of 3 : 1. The comparative expense arising from the extra interest of capital, and the annual charges and maintenance of a canal, may reduce this proportionate performance near to an equality; or, if the one compensate for the other, then perhaps the less investment of capital in a rail road, and the greater certainty of transit, may make it superior to a canal; but, unless the disparity of cost is great between a rail road entering into competition with an existing canal, or unless some extraordinary circumstances in the nature of the traffic occur, it may be difficult to say, when horses are the motive power on each, which is superior." (Wood on Rail Roads.)

The writer in England on the subject of rail roads, next in celebrity to Wood, is Tredgold, a member of the institution of civil engineers, whose treatise was re-published in New York in 1825.

"In discussing," he says, "the merits of rail roads, we have to compare them with turnpike roads and with canals. Rail roads give the certainty of the turnpike road, with a saving of seven-eighths of the power; one horse on a rail road producing as much effect as eight horses on a turnpike road. In the effect produced by a given power, the rail road is *about a mean* between the turnpike road and a canal, when the rate is about three miles an hour; but where greater speed of conveyance is desirable, the rail road equals the canal in effect, and even surpasses it." (Page 3, of the New York edition.)

"When it is attempted to compare rail roads with canals or common roads, it must be obvious that each mode has its peculiarities: the same may be said of each line of traffic." (Id. page 8.)

"Both the first cost and the annual repairs of a canal exceed those of a railway; the excess differing according to the nature of the country. But in a country suited for a canal, the difference of first expense *is more than compensated by a greater effect produced by a given power on a canal than on a railway, provided the motion does not differ much from three miles an hour, and this renders a canal decidedly better for a level district.* On account of the resistance increasing in the ratio of the squares of the velocities, when bodies move in fluids, and also *on account of the injury the banks* would suffer by too rapid a movement of the water, the velocity of canal boats must be considered as limited to a speed not far exceeding that which they obtain at present; but on a railway, a greater velocity may be obtained with less exertion, even where animal power is employed." (Id page 9.)

"The average cost of a proper rail road with a double set of tracks, will not be less than £5000 sterling (or 22,222 dollars) per mile, when all the expenses in our list are included, and the works are done in a good and substantial manner." (Id. p. 141.)

The Liverpool and Manchester rail road, thirty-two miles long, is known certainly to have cost three times that sum, and rumor makes it nearer six times.

"From a list of estimates for no fewer than seventy-five canals, including those of the greatest and least expense, a writer in the Quarterly Review, No. 62, p. 363, draws a general average of £7,946 (35,280 dollars) per mile; but it is well known that these works have rarely, if ever, been executed for the estimated expense." "The Union canal cost £12,000 (52,280 dollars) per mile: the Forth and Clyde, £12,400" (54,056 dollars.) (Id. p. 143.)

"The average cost of a canal may be estimated at £10,000 per mile," (44,444 dollars.) (Id. p. 143.)

"Smeaton informs us that twenty-two tons burden, at from two, to two and a quarter miles per hour, is the work of a horse on a canal. And Mr. Beavan has informed us that the horses on the Grand Junction canal usually travel twenty-six miles per day, and draw a boat containing twenty-four tons at the rate of 2.45 miles per hour; the empty boat being nearly nine tons, the whole mass moved is about thirty-three tons; and the average force of traction he found to be eighty pounds." (Id. p. 150.)

TABLE V.

A TABLE showing the effects of a power or force of traction of one hundred pounds, at different velocities, on canals, rail roads, and turnpike roads.

Velocity of motion.		LOAD MOVED BY A POWER OF 100 LBS.					
		On a canal.		On a level railway.		On a level turnpike road.	
Miles per hour	Feet per second.	Total mass moved.	Useful effect.	Total mass moved.	Useful effect.	Total mass moved.	Useful effect.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
2½	3.66	55,500	39,400	14,400	10,800	1,800	1,350
3	4.40	38,542	27,361	14,400	10,800	1,800	1,350
3½	5.13	28,316	20,100	14,400	10,800	1,800	1,350
4	5.86	21,680	15,390	14,400	10,800	1,800	1,350
5	7.33	13,875	9,850	14,400	10,800	1,800	1,350
6	8.80	9,635	6,840	14,400	10,800	1,800	1,350
7	10.26	7,080	5,026	14,400	10,800	1,800	1,350
8	11.73	5,420	3,848	14,400	10,800	1,800	1,350
9	13.20	4,282	3,040	14,400	10,800	1,800	1,350
10	14.66	3,468	2,462	14,400	10,800	1,800	1,350
13.5	19.9	1,900	1,350	14,400	10,800	1,800	1,350

"TABLE V.—This table is to show the work that may be performed by the same mechanical power, at different velocities, on canals, rail roads, and turnpike roads. Ascending and descending by locks on canals may be considered equivalent to the ascent and descent of inclinations on rail roads and turnpike roads. The load carried, added to the weight of the vessel or carriage which contains it, forms the total mass moved; and the useful effect is the load. To find the effect on canals at different velocities, the effect of the given power at one velocity being known, it will be as $3^2 : 2.5^2 :: 55,$-

500 : 38,542. The mass moved being very nearly inversely as the square of the velocity.

"This table shows, that when the velocity is five miles per hour, it requires less power to obtain the same effect on a railway than on a canal; and we have added the lower range of figures to show the velocity at which the effect on a canal is only equal to that on a turnpike road. By comparing the power and tonnage of steam vessels, it will be found that the rate of decrease of power by increase of velocity, is not very distant from the truth; but we know that in a narrow canal the resistance increases in a more rapid ratio than as the square of the velocity: only we have not time to spare to follow up the inquiry at this moment. Other tables of a similar kind have been published, and we find our column exhibiting the useful effect on canals nearly agrees with that of Mr. M., the ingenious author of a series of essays on the subject, which first appeared in the Scotsman; but we differ respecting railways, his being more in favour of rail roads. From Mr. Sylvester's table this differs very considerably: he has underrated the effect on canals as much as he has overrated the effect on railways and common roads."

It is proper to remark, that from Tredgold, as from other English treatises on rail roads, passages may be extracted less favorable than the preceding to the superiority of canals: but enough is here quoted to show the uncertainty still hanging over the question, whether canals or rail roads are to be preferred for the transportation of persons and property. No two authors, scarcely, will be found to concur precisely in opinion on the subject, nor the same author with himself: while the relative cost of canals and railways depends so much on the surface of the country over which they are conducted, that nothing short of their actual cost can supply a standard to measure it.

The greater part of the extracts from treatises on rail roads made by the Baltimore committee, (in 1827,) were from a work entitled "Gray's Observations on a General Iron Rail Way," the fifth edition of which was published in 1825.

The following extracts from the very same work, show the importance of having presented both sides of the question, now made between the advantages of canals and rail roads.

"In order," says Tredgold, "to establish a general iron railway, it will be necessary to lay down *two* or *three* railways for the *ascending, and an equal number for the descending vehicles.*" (Page 12.)

"In the immediate neighborhood of London, the traffic might demand six railways." (Page 12.)

"Wagons laden with merchandise can never expect to proceed with the same velocity as coaches." (Page 12, 13.)

"It is desirable to show the probable expense of this scheme, but this depends almost entirely upon the state of the country through which it may be found necessary to pass." (Page 13.)

"By the second extract it will be seen, that the sums quoted as the expense of railways, vary too much to be depended on." Page 13.

"Mechanic power, when once put to the test, by comparison on land and water, will, *no doubt*, prove more favorable by the former, in proportion as that element is *more stable*, and not under the influence of *wind, tides, or currents.*" (Gray's Observations, &c.)

And from the Appendix to the above edition of this work, the following passages merit attention: "On the whole, then, it may be concluded that,

on a level team road, making allowance for the weight of the wagon, one horse will be required for every four tons of coal, or other articles conveyed; and, on an edge railway, one horse will be required for every seven tons. On an ordinary canal, one horse, with a boat, will be sufficient for eighty tons. But the first cost of a canal is three or four times greater than that of a railway; so that, in some cases, *it may become a question*, whether a railway might not be adopted with advantage." Page 178.

"The public in general entertain wrong impressions respecting railways; they never hear them mentioned, without recurring to such as are seen in the neighborhood of coal pits and stone quarries. But such improvements have taken place, that they are no longer the same thing; besides which, a railway *without a locomotive engine*, is something *like a cart without a horse, a trade* without profit, or a *canal without water.*" (Pages 184 and 185.)

"On a canal, a horse, travelling at two miles an hour, draws 30 tons, in a boat weighing probably 15 tons. Reducing the ton to 2,000 pounds, for the sake of round numbers, as in the last calculation, we find here that a power of traction of 100 pounds moves a mass of 90,000 pounds, or the resistance which the water opposes to the motion of the vessel is equal to one nine hundredth part of the load or entire weight. At sea, where the water is of unlimited breadth, the resistance probably is one-third less."

"We see, then, that the effect produced by the draught of a single horse is ten times as great upon a railway, and thirty times as great upon a canal, as upon a well made road: yet a railway costs only about three times as much as a good turnpike road, and a canal about nine or ten times as much." "With regard to the comparative advantages of canals and railways, *so far as the present facts go*, we may observe, that, if a horse power effects three times as much upon a canal as upon a railway, the canal costs about three times as much, and will of course require nearly the same rates or dues per ton, to make the capital yield the same interest." (Pages 206 and 207.)

"Rail roads, as hitherto worked by horses, *possess very little*, if any, *advantage over canals;* but rail roads worked by the locomotive steam engine, have so decided a superiority, both as it regards time and expense, that there can be no question but they will be generally adopted wherever a new line of conveyance has become necessary, either *from an increased trade*, or from the *exorbitant demands of canal proprietors.*" (Page 185.)

Here is the true secret of the imputed superiority of rail roads to canals in England: the former are designed to break down a very lucrative monopoly, which had, in some cases, when this author wrote, swelled the profit of certain canals so high, that, on that of the Trent and Mersey, as he informs his readers, £75 was the annual dividend on a single share of £100 original cost, which was selling in December, 1824, at £2,300 advance on the £100; yet this canal has three tunnels, one of 2,880 yards, and another of 1,241, in 22 miles, and two aqueducts, of which that over the river Dove has 23 arches.

The Appendix of the work, from which the above quotations are made, speaking of *another canal*, that between Birmingham and Liverpool, avers, as an argument for breaking down, or dividing, by means of a rail road, *its* long uncontested monopoly, that the original shares had risen from £140 sterling to the sum of £2,840; and adds: "These facts on the increased value of this canal, which exceeds twenty times its original cost,

prove, also, that the public transits might have been performed at much cheaper rates, and yet the company obtain an adequate remuneration."

The tolls on the Chesapeake and Ohio canal are not only limited to two cents per ton per mile, but the profit on any possible amount of tonnage, to 15 per cent. on the capital expended. The freight for carriage, left by law to be reduced by open competition on the public highway, which the canal affords to every boatman who may please to use it, the experience of the Lehigh navigation demonstrates, on a smaller canal, will not exceed one cent per ton per mile.

The Baltimore and Ohio Rail Road Company, on the other hand, are allowed to charge for toll and transportation, from west to east, four cents per ton per mile, from east to west six cents; and their charter allows them to be the exclusive carriers, with no other limitation to the extent of their future profit.

The exclusive advocates of railways insist, with admitted truth, that they can carry with greater speed; that the resistance of water to the motion of a canal boat increases, at every addition to its speed, in the ratio of the square of its velocity. Be it so. A single horse can draw, in a boat, on a canal, at the rate of two miles an hour, (the Appendix to Gray affirms, page 206,) 90,000 pounds; consequently, at four miles an hour, he could draw but the one fourth of that weight, or 25,000 pounds; but at one mile an hour, he could draw 360,000 pounds; and at half a mile an hour, the enormous weight of 1,440,000 pounds. Thus a single horse draws, on the large canal between Amsterdam and the Helder, a ship of several hundred tons. On the Champlain canal, a gentleman met a raft of timber so united by a single plank, with a pivot for each lockhold of the long raft, that one horse drew it with facility at the rate of a mile an hour. It was from the lake, and then on its way to Albany; its computed weight was 200 tons, and the horse had drawn it the entire length of the Champlain canal. What velocity, and how many rail road cars would be required to balance the economy of this transportation? Yet a full moiety of the revenue of the New York canals is derived from the productions of the forest, in their rudest form. Would any contemplated speed of a carriage on a railway, which, at most, could but save the interest of a few days or hours on their small capital vested in this vast moving mass of wood, countervail the cheapness of this slow voyage?

One great advantage attending the canal on which it was drawn is, that the swiftest packet boat, in meeting or overtaking such a raft, can pass it by, without the least obstruction, or a moment's delay. On a canal 60 feet wide, the tracks are never impeded by heavy carriages.

It is not an easy task, in America, to account for the extraordinary error, error it certainly would be in the United States, of computing, as all the late English writers do, the cost of a canal, as three, four, or five times that of a rail road

The Erie canal of New York, has been variously computed by the canal commissioners of that State, at from $18,000 to $23,000 the mile. The canals of Ohio exceed in cost, very little, if at all, $10,000 the mile; which will probably be found to be the cost of all canals in America of the same dimensions, and involving only moderate lockage, and no very deep cutting, or long tunnels. The eastern section of the Chesapeake and Ohio Canal, extending from Georgetown to Cumberland, of dimensions exceeding those of

the canals of New York and Ohio in the ratio of two and a quarter to one, will probably cost twenty-five thousand dollars a mile.

One mile of this canal at Noland's ferry, in Frederick county, Maryland, the first mile completed, did actually cost *less* than forty-three hundred dollars; and a half mile, below it, less than eighteen hundred dollars. While the cheapest mile of the only rail road, which could justly be compared with a canal of such dimensions, one of four tracks, would cost in the United States, *after the surface of the road was graduated,* not less than twenty thousand dollars for the addition of the iron railways, and, if laid on a solid stone foundation, probably twice that sum.

Experience will shortly determine *some of the elements* of a just calculation of the relative cost of rail roads and canals. It has been already shown, that their relative cost, in England, furnishes no just measure of their relative cost in America.

O.

As far back as 1803, the Surry iron rail road had been completed in England, under the eye, almost, of her great commercial and political metropolis; for its distance from the capital of the British empire is but eight miles; and it is crossed by the public highway, between London and Epsom, a village of no little note, for its periodical races, its mineral waters, and the beautiful scenery of its neighborhood.

Yet, a very short period ago, (less than two years,) no rail road stock had reached an advance of one hundred per cent. above par, in the English market; while the following were, at that time, the prices of the several canal and road stocks comprehended in the subjoined tables.

The tables of the prices of canal, road, and railway stocks, in the London market, on the 11th of March, 1828, are extracted from the trade list of that day, which was published weekly by an assistant clerk of the bills of entry of the British customs, and may be, consequently, deemed to have an official sanction.

The two last are copied from the trade list, without reduction, or alteration. The first table comprises only thirty-two, of more than eighty canals, in Great Britain.

Of the thirty-two canals, the stocks were selling, a few few years ago, (about 1822,) at the prices set opposite to their names in the column added to the table extracted from the trade list, and their dividends were then, as stated in the parallel column. The prices of the other canal stocks, at that period, would be inserted, if known.

These tables furnish the best, because incontrovertible evidence, of the estimation of canal stocks in England at the time when they were formed.

Names of canals.	Original cost of each share.	Present price of each share.	Price of each share in 1828.*	Dividend on each share.	Dividend in 1822.*	No. of shares.	Average cost.
	l. *s.*	*l.*	*l.*	*l.* *s.* *d.*	*l.*		*l.* *s.* *d.*
Barnesley - -	160	300	-	13	-	5720	
Birmingham -	17 10	203	565	12 10	20	4000	
Carlisle - -	50	490	-	-	-	1600	21 10
Chesterfield - -	100	150	120	8	8	1500	
Coventry - -	100	1200	999	44	44	500	
Cromford - -	100	400	-	19	-	460	
Derby - -	100	150	-	7 10	-	600	110
Erewash - -	100	1400	1000	72	58	231	
Forth and Clyde -	100	570	-	25	-	1297	400 16
Glamorganshire -	100	250	-	13 12 8	-	600	172 13 4
Grand Junction -	100	307	218	13	9	11600	
Grantham - -	150	215	-	9	-	749	150
Leeds and Liverpool	100	395	278	16	10	2897¾	
Leicester - -	100	325	260	17	10	540	140
Loughborough -	100	4000	2400	200	119	70	142 17
Milton Mowbray -	100	240	170	11	8½	250	
Mersey and Erwell	100	825	650	35	30	500	
Monmouthshire -	100	215	-	10	-	2409	100
Neath - -	100	350	-	15	-	247	107 10
Nottingham -	150	290	-	12	-	500	
Oxford - -	100	670	640	32	32	1786	
Shrewsbury -	125	210	-	10	-	500	
Shropshire - -	125	135	-	7	-	500	
Somerset Coal -	50	170	-	10	-	800	
Stafford and Worcester - -	140	800	642	40	40	700	140
Stourbridge - -	145	220	-	12	-	300	
Stroudwater -	150	450	-	23	-	200	
Swansea - -	100	280	-	12 10	-	533	
Trent and Mersey -	100	820	900	37 10	75	1300½	
Warwick and Birmingham -	100	265	210	12	11	1000	
Warwick and Napton	100	205	235	12	10	980	
Wyrley and Essington - -	125	160	-	6	-	800	

* Price in 1821, from the Monthly Magazine, transcribed from the report of the Ohio canal commissioners, of January 21st, 1824; to which they add the following remark: "From the above it appears that canal stocks in England, of the medium original cost of £1525, pay a medium dividend of £485, exceeding 31¾ per cent. per annum; and are now worth £9287, more than six times their original cost."

Prices of road stocks of the same date.

ROADS.	Original cost of each share.	Present price of each share.	Dividend on each share.	No of shares.	Average cost.
	l.	*l. s.*	*l. s.*		*l. s.*
New North - - -	50	60	3	221	50
Archway and Kentishtown -	-	15	15	533	30
Barking - - -	100	56	2 10	300	
Commercial - - -	100	121	6	1000	
Do. East India Branch -	100	100	5	2000	
Gt. Dover Street - -	100	37	2 11	492	70
Highgate Archway - -	50	6 15	-	2393	30 8
Thames tunnel - -	50	41	-	4000	46 pd
Holloway - - -	50	37 10	-	200	37 10 pd
IRON RAILWAYS.					
Manchester and Liverpool -	100	20½ pm	10	3000	40 pd
Cromford and High Park -	100	-	-	1600	40 pd
Canterbury - - -	50	25	-	500	25 pd
Cheltenham - - -	100	78	-	350	
Croydon - - -	65	-	-	1000	
Surrey - - -	60	-	-	1000	
Severn and Wye do. - -	50	23	1 11	3762	
Poplar and Greenwich Ferry -	-	-	-	-	
Woolwich Ferry - -	100	-	-	-	
Stockton and Darlington -	100	160	5	640	100 pd
Monmouth - - -	50	-	-	553	
Forest of Dean - -	50	45	2 16	2500	50 pd

It is obvious, under such circumstances, that rail-road stocks, yielding on the same capital, one half, in some neighborhoods; in others, a fourth, a tenth, or a twentieth part of the profit of certain canals in the same neighborhoods, would furnish profitable and attractive investments for money. And in aid of these, engineers of every description, and pamphleteers too, would not be wanting, after the canal system of that kingdom had been already pushed to the utmost limits of its land and water, to recommend rail ways in preference to canals.

A fair experiment of their relative utility would be dependent on so many circumstances, as regards their relative plans, location, cost, and species of traffic, that many years would be consumed in bringing it to a satisfactory conclusion.

In the first stages of such an experiment, a canal, liable to frequent interruptions from the unsettled state of its banks, would labor under great comparative disadvantages; while the rail road would possess the recommendation of being new, and, therefore, in its most perfect condition. Their relative profits would depend, of course, on the proportion of their nett income, to the cost of their construction, and the former subject of this

comparison would, itself, depend on the expense of those very repairs, which would be diminishing, on the canal, as its banks acquired stability from time, and increasing upon the rail road, as use impaired its strength, by friction, frequent changes of temperature, and unforeseen accidents.

As to the relative speed of transportation on both, the decision of that question must await the equal use of both the canal and rail road, for a considerable period, and under various circumstances, by the same amount of tonnage. It is difficult even to conceive how a rail road, with but two tracks, and having both occupied, at the same time, by very numerous and heavy laden cars moving in opposite directions, can admit of the velocity, which, it is believed, a boat may attain, on a canal, without the slightest interference with any other vessels moving on the same surface, in opposite directions, and with different velocities.

Of the possible application of steam, to canals, not indeed, to such canals as those which so often occur in England, but to the canal of the Forth and Clyde, in Scotland, which is of the same breadth with the Chesapeake and Ohio canal, a doubt can no longer be entertained, notwithstanding the numerous and very confident authorities cited to disprove it, by the Baltimore and Ohio rail road company; all of which, indeed, derive their whole force, as they doubtless do their existence, from their application to the comparatively narrow and shallow canals of England.

A reference to the able essay of the practical civil engineer superintending the Lehigh Coal and Navigation Company's works in Pennsylvania, who, having both a railway and a canal under his charge, with abundant experience, has no motive whatever to deceive himself or others, will shed more real light, on this inquiry, than all the British authorities united; and his suggestion of various modes of diminishing the expense, and of accelerating the speed of transportation on canals, while it evinces his mastery of his profession, may inspire at least a doubt, whether *mechanical genius* may not hereafter find as full exercise for its invention, in improving the navigation of canals, as in propelling rail road cars.

When, therefore, the appeal to public opinion shall be so far settled, as to authorize the federal government to decide a question, which now perplexes the civil engineer, the committee on roads and canals have not, in their report, distinctly intimated, and could not probably determine.

One thing which is certain, they appear not to have known, that the Chesapeake and Ohio canal company depend on the prosecution of their work, above "the Point of Rocks," for a supply of water, to five and twenty miles of their canal, now nearly completed, below that point; and, therefore, that the result *of the experiment which they have recommended,* could not be patiently awaited by that company, without most serious loss to their stockholders, and to the public.

Another fact is alike obvious, that if the rail road shall hereafter be deemed a better mode of connecting the Potomac and Ohio markets, than any canal whatever, the discovery will have been made too late, to save from almost total ruin, the capital of the Chesapeake and Ohio canal company; since, to break the continuity of the voyage up the river Potomac, above the Point of Rocks, would render its navigation, below, of very little value.

P.

If, as two of the most eminent civil engineers have said, after careful inquiry, the internal intercourse of England be not sufficiently active to warrant the use of *stationary steam engines*, on such a rail road as that between Manchester and Liverpool, the cost of which, it is ascertained, will exceed $100,000 a mile, it must be manifest that the United States cannot, in the present state of their population and commerce, avail themselves of the cheapest propelling power applicable to rail roads.

Whether America be ripe for the profitable employment of *locomotive engines* between her chief cities, or between those cities and the country which sustains them, is a question yet to be tried and determined by experience. If mere animal force be, at present, the most economical moving power on rail roads and canals, then their relative value is admitted to be unequivocally settled in favor of the latter.

Rail roads are universally acknowledged to be greatly superior to all other roads; and the time may, and probably will arrive, in the United States, when, constructed with many tracks, for carriages moving, at the same time, with different velocities, in the same as well as in opposite directions, and propelled by *stationary engines*, having sufficient occupation to sustain their constant, and therefore profitable use, rail roads will prove formidable, if not successful, rivals of canals. In the interim, it cannot be wise, or prudent, to arrest the improvement of a country, by institutions suited to its actual condition, because, it is expected that, at some future and distant period, these may be superseded by inventions of more expensive structure and costly application.

In the progress of navigation, the floating raft, the bark canoe, the open boat, and the decked vessel, varying in size, from the light sloop which scuds along the coast, to the magnificent indiaman, or the awful battle ship, which braves the ocean and the storm, have all their appropriate places.

Indulging similar views of the future march of invention, should it so happen in process of time, as there is much latitude for hope, if not sufficient ground for confident prediction, that, by the introduction of steam power on canals, or the use of a part of their surplus water to propel their boats, on the principle of the action of the stationary engine on the rail way, the expense attending canal navigation may be greatly reduced, and its velocity be proportionably accelerated, the spirit of liberal and enlightened competition, which rail roads have recently awakened both in Europe and America, will yield to commercial and social intercourse, to the union of States, and the happiness of their people, as substantial benefits, as if the most flattering promises of their exclusive advocates had been fully realized.

22d Congress, 1st Session. [Doc. No. 217.] Ho. of Reps.

CHESAPEAKE AND OHIO CANAL COMPANY—ACT OF MARYLAND.

[*To accompany the bill H. R. No.* 554.]

April 25, 1832.

Printed by order of the House of Representatives.

AN ACT

Further to amend the act incorporating the Chesapeake and Ohio Canal Company.

Be it enacted by the General Assembly of Maryland, That, if any person or persons shall wilfully, by any means whatever, injure, impair, or destroy any part of the Chesapeake and Ohio canal, or any part of its feeders, dams, locks, aqueducts, culverts, walls, embankments, bridges, buildings, or other works now constructed, or which may hereafter be constructed, by the Chesapeake and Ohio Canal Company, under the several acts incorporating the said canal company, or amendatory thereof, or supplementary thereto, such person or persons so offending shall, each of them, for every such offence, forfeit and pay to the said canal company a sum not exceeding fifty dollars, recoverable by action of debt before any justice of the peace in and for the county wherein the offence shall be committed, reserving to the parties the right of appeal from the decision of the said justice of the peace to the county court in the county in which judgment may be had; or every such offender shall be subject to indictment in the court for the county in which the offence shall be committed, and, upon conviction of such offence, shall be punished by fine or imprisonment, or both, in the discretion of the court.

2d. *And be it enacted*, That the president and directors of the Chesapeake and Ohio Canal Company, or a majority of them, acting in behalf of the said company, shall be, and they are hereby, authorized and empowered, from time to time, to pass all bye-laws which may be necessary for the exercise of the powers vested in said company by the several acts incorporating the same, or amendatory thereof, or supplementary thereto: *Provided, always*, That such bye-laws shall not be contrary to the laws of this State, of the United States, or of the States in which they operate; and that the said company shall not be authorized, by any such bye-laws or regulations, to prevent the proprietor or proprietors of any lands through which the said canal, dams, basins, feeders, or other appurtenant works may be constructed, *from joining or connecting with the said works any fence or wall which shall not be found to injure the works aforesaid; nor to prohibit the aforesaid proprietor or proprietors* from having access to the said

canal and its appurtenant works, at the most convenient places; and *from crossing and re-crossing the same, at their discretion*, in any of the modes hitherto agreed upon by the said company; *Provided, in doing so, they do not impede the navigation or injure the said works;* and if any person or persons shall wilfully offend against any such bye-law, after a copy thereof shall have been set up for public inspection at each of the toll-houses on said canal, such person or persons, so offending, shall, each of them, for every such offence forfeit and pay to the said company the sum of five dollars, to be recovered in the name of said company before any justice of the peace for the county wherein the offence may be committed.

3d. *And be it enacted*, That the said president and directors, or a majority of them, acting in behalf of the Chesapeake and Ohio Canal Company, may prescribe the form, dimensions, and equipment of the boats and floats to be used upon the canal, with a view to prevent accidental injury to them, or to the works of the canal, in passing each other, or in passing by or through any of those works; and if the owner, captain, or other person having charge of any boat or float, shall negligently violate or refuse to comply with any such regulation, the president and directors may require the owner, captain, or other person having charge thereof, to withdraw his said boat or float from the canal by some one of the outlets thereof; or, in the event of his failure to do so on reasonable notice, may order the same to be broken up and removed from the canal or any of its basins, ponds, feeders, or other works; and, in like manner, may be broken up and removed from the canal, or any of its basins, ponds, or feeders, any boat, float, or other substance floating loose upon, or sunk therein, the owner of which is unknown, or, if known, neglects or refuses, after reasonable notice, to remove the same; and the materials of the broken boat, float, or other substance, so broken up and removed, shall be the property of the canal company, and be applied to defray the cost of breaking up and removing such nuisance.

4th. *And be it enacted*, That it shall be lawful for any collector of tolls to refuse to pass any boat, float, produce, or other article, through any part of the Chesapeake and Ohio canal or its locks, until the tolls properly chargeable thereon shall be paid; and if any boat, float, produce, or other article, shall pass through any part of the canal or its locks, and the owner, captain, or other person having charge thereof, shall neglect or refuse to pay the tolls due thereon, then any collector of tolls in the employment of the canal company may seize such boat, float, produce, or other article wherever found, and sell the same at auction for ready money, which, so far as may be necessary, shall be applied towards paying the said toll and all expenses of seizure and sale, and the balance, if any, shall be paid to the owner.

5th. *And be it enacted*, That whensoever it may be necessary to obtain earth, stone, timber, or other materials for repairing the Chesapeake and Ohio canal, or any of its appurtenant works, and the president and directors of the canal company, or their properly authorized agent, cannot agree with the owner or owners thereof for the same, or when the owner or owners thereof shall be a *feme covert*, under age, *non compos*, or out of the State, district, or county, the same proceedings shall be had to obtain the same, as are required by the 15th and 19th sections of the act of the General Assembly of Virginia, entitled "An act incorporating the Chesapeake and Ohio Canal Company," and confirmed by the General Assembly of Maryland, at its December session of the year 1824, in relation to the purchase or condemnation of lands and materials for the construction of the canal.

6th. *And be it enacted,* That whenever it shall be necessary for the said company to require a condemnation of any materials for repairing the said canal, or its appurtenant works, the said company, or their properly authorized agent, may immediately take and use the same, having first caused the property wanted to be viewed by a jury; and it shall not be necessary, after such view, to wait the issue of the proceedings upon such view: *Provided,* That the said company, their officers or agents, shall not occupy, hold, or possess, any piece or parcel of land, without the consent of the owner or owners thereof, longer than the said jury shall declare necessary for obtaining earth, stone, timber, or other materials needed at the time for repairing the said canal and its appurtenant works.

7th. *And be it enacted,* That the several sections or provisions of this act shall, respectively, commence and take effect, so far as regards the State of Maryland, from the passage thereof; as regards the United States and the State of Virginia, so far as they may respectively assent to any or all of its provisions; and, on receiving the further assent of the Legislature of Pennsylvania, they shall be deemed to be, so far as such assent may extend, a part of the charter of the Chesapeake and Ohio Canal Company.

We hereby certify that the aforegoing is a true copy of the original bill, entitled "An act further to amend the act incorporating the Chesapeake and Ohio Canal Company," which passed the General Assembly of Maryland, at December session, one thousand eight hundred and thirty-one.

Given under our hands, at the city of Annapolis, this 23d day of March, 1832.

JOS. H. NICHOLSON,
Clerk Senate of Maryland.
GEORGE G. BREWER,
Clerk House Delegates of Maryland.

22d Congress, 1st Session. [Doc. No. 18.] Ho. of Reps.

CHESAPEAKE AND OHIO CANAL COMPANY.

December 19, 1831.
Referred to the Committee on Internal Improvements.
Dec. 20, 1831.
Ordered to be printed.

To the Senate and House of Representatives of the United States of America in Congress assembled:

The memorial of the Chesapeake and Ohio Canal Company, by the President and Directors thereof, pursuant to a resolution of the Stockholders, in general meeting, most respectfully represents:—(A.)

That the final decision of the long depending controversy between the Chesapeake and Ohio Canal Company and the Baltimore and Ohio Rail-road Company, which may now be shortly expected, by determining the bank of the Potomac which the canal shall occupy, above the Kitoctan mountain, will afford employment, on its eastern section, in the approaching year, for all the present capital of the company. By means of this capital, it is confidently expected to reach, with the canal, the present paved road leading from the Potomac to the Ohio river, by Cumberland, in the State of Maryland, at a point one hundred and twenty miles above the city of Washington. (B.)

But this result cannot be accomplished if, according to the condition of the act of Pennsylvania of February, 1826, incorporating the Chesapeake and Ohio Canal Company, the million of dollars subscribed to that great national work by the United States, be equally divided between its eastern and western sections. (C.)

So divided, and unaided by other large subscriptions of stock, which such a division would be calculated to impede rather than to promote, the sum which the United States' subscription would yield to either section, even if the charter granted by the United States, and the other States who are parties to this enterprise, permitted the western section to be begun before the eastern shall have been completed, would be incompetent to the purpose, so much desired, of promptly reaching the artificial road near Hancock; and would carry the western section too short a distance above Pittsburg to be of essential benefit to the great interests which the canal is designed to promote.

With these impressions, your memorialists, more than two years ago, authorized an application to all the parties to their charter, for a dispensation from the obligation of finishing the eastern prior to the commencement of the western section of the canal, with an understanding that it should be accompanied by an effort to obtain, by new subscriptions of stock, adequate funds to commence the western section; and, if these could not be promptly had, by a release, from the State of Pennsylvania, of the condition already recited from her act of incorporation.

The result of this application has been a ready compliance, on the part of Virginia, with the wishes of the company, as will be seen in the annexed act of her Legislature; a continued delay on the part of Maryland to accede to the terms of this act, and a refusal on that of Pennsylvania to dispense with the limitation in her act of 1826, coupled, however, with a recommendation, by her Legislature, to Congress, to enlarge the subscription of the United States to an extent calculated to subserve the interests of that State, as well as of your memorialists; and it may be hoped of the other parties to their charter. (D.)

In referring to the provision of the late act of the General Assembly of Pennsylvania, proceeded as it was by the earnest petitions to your honorable body, of many of the citizens of that enlightened commonwealth, your memorialists have suggested, they trust, considerations which cannot fail to recommend the proposed enlargement of the powers of the company to your favorable regard.

As a compliance with the views of Pennsylvania, and the obvious interests of the stockholders in general, and, consequently, of the United States, one of the largest subscribers to the funds of the company, have rendered it the duty of the memorialists to associate another object with that which they have suggested—a correspondent enlargement of the resources of the company—they proceed to bring to your notice the present condition and future prospects of the great enterprise confided to their management, so far as these may be deemed to have a pertinent bearing on the second purpose of this memorial.

The condition of the Chesapeake and Ohio canal, and of the funds of the company, at the period of the general meeting of the stockholders in June last, is disclosed in the accompanying annual report of the President and Directors, to the stockholders, at their last annual meeting; in the annexed tables exhibiting the cost of its various works, and the report of the manner of their execution, made by Colonels Abert and Kearney, of the corps of United States' Engineers, to the Secretary of War, pursuant to an order of that department. (E.)

From these documents, hereto annexed, it will appear that the construction of the canal has been completed as far west, as no legal obstacle opposed its progress; that, for forty-eight miles above Washington, its various works had been, with scarcely an exception, faithfully executed; and that, between its first and second feeders, where the greatest physical obstructions were to be overcome, its navigation has been long in active use.

From these facts, it may be inferred that the construction of the canal, but for the injunction of the Chancellor of Maryland, might, in the same time, have been carried, as far up the left bank of the Potomac, as the funds of the company would warrant; as it may, from the actual cost of the part which has been completed, that the expense of the whole eastern section, making but a reasonable allowance for the great enlargement of its dimensions, will not much exceed the estimate of Messrs. Geddes and Roberts, nor that of prior date, by the Central Committee of the Chesapeake and Ohio Canal Convention, from the proceedings of which the charter of your memorialists originated.

Those estimates were applied, respectively, to three different canals, or to three several dimensions of a canal, passing, as nearly as practicable, over the same ground. The estimate for the first of these, having the same plan and dimensions with the State canals of New York, Pennsylvania, and

Ohio, viz: being forty feet at the surface, and four feet deep, and extending from Georgetown to Cumberland, a distance of 186¾ miles, amounted to the sum of $4,008,065 28, or $21,461 87 per mile; for one extending the same distance, and along the same shore of the Potomac, with a breadth of 48 feet at the surface, and a depth of 5, they computed at $4,380,991 68, or $23,191 38 per mile; and for a third, of the same depth with the second, but having, for 126 of the 186¾ miles, a breadth at the surface of 60 feet, and at bottom of 42, they computed at $4,479,346 73, or at $23,985 76 per mile.

The difference between these estimates, when compared with the relative resistance to be encountered by the same boat, in passing along these several canals, induced not only a preference of the largest of the preceding plans, but an enlargement of that, to a depth of six feet, (F). Accordingly, the canal placed under contract, and now nearly completed, is no where less than six feet deep; and, except for about three fourths of a mile, made up of short spaces, here and there, at which, on account of peculiar difficulties, it is reduced in breadth to about fifty feet; its least width at the surface is sixty feet, and at bottom forty-two feet; affording a cross section of 306 feet. It may be proper, here, to remark, that the cross section of the New York canals is 136 feet only, and that of the canal recommended by the United States' engineers no where exceeds, and often falls below, 202½ feet.

The locks of the Chesapeake and Ohio canal are consequently one foot deeper, and being in their chamber 100 feet by 15, they are ten feet longer than those recommended by Messrs. Geddes and Roberts. They exceed in depth, to the same extent, those proposed by the United States' board of internal improvement: and though less in length by 4 feet, they exceed the latter by 1 foot in breadth, being calculated for boats ninety feet long and fourteen feet eight inches wide, drawing four feet water, capable of carrying, each, one hundred tons, and of being propelled by the labor of two, or at most of three, horses, assisted by two men and a boy.

The breadth of this canal being about "four and a half times the breadth of the boat, and its cross section very nearly six times that of the boat, the latter will move with a moderate velocity, as on an indefinite expanse of water." (Vide App. F). But, the memorialists extend their views beyond this result. Turning to practical advantage the rock which abounds every where along the line of the canal, and which has so greatly enhanced its first cost, they purpose, by walling its inner slopes, not only to obviate the necessity of future repairs, but, also, to fit this line of communication between the east and the west, for the use of steam, as its propelling power.

On the Chesapeake and Delaware canal, the breadth of which was designed to be sixty, and its depth eight feet, a velocity of seven miles an hour has been already attained by animal labor, and has superseded a resort to land transportation, for persons as well as property, across the peninsula between the cities of Baltimore and Philadelphia.

Economy, rather than velocity, being the great desideratum in the transportation to market of the very heavy and bulky products of the American forests, mines, and agriculture, the purpose of this canal would have been accomplished without looking to this powerful agent. By the efficacy of steam, however, combined with the enlarged volume of the Chesapeake and Ohio canal, passage boats, it is believed, may be expedited on its surface with a rapidity surpassed, at present, only on the best improved mail roads. In this anticipation, your memorialists make no allowance for those discove-

ries which are daily surprising the world with new applications of art and science to human use and comfort They do, however, confidently rely on very recent experiments on the Ardrossan, as well as upon the Monkland, the Union, and the Forth and Clyde canals of Scotland, referred to in the annual report appended to this memorial, which have demonstrated the fallacy of all former philosophical calculations, of the resistance encountered by boats moving on a canal with different velocities.

Without greatly increasing the propelling power of the passage boat, or materially endangering the abrasion of the banks of a canal, the speed of such boat may, it has now been demonstrated, be accelerated, from six to nine, ten, or even twelve miles an hour. The previously established ratio of the resistance to the velocity of the boat applying, it is now discovered, to slow and not to quick motion.

Should the views of your memorialists meet the approbation of the several parties to the charter of the Chesapeake and Ohio Canal Company, and the western section of the canal be immediately begun, and conducted up the Monongahela and Yougheogany rivers, the portion of the canal between Pittsburg and Connelsville may be first executed, being a distance of less than sixty miles. A canal extending 58¾ miles above Pittsburg, having a depth of six feet water, with a breadth of sixty feet at its surface, and forty-two feet at bottom, overcoming an ascent of 146 feet 4 inches, by nineteen lock has been computed, by two practical civil engineers, Messrs. Roberts and C uger, of New York, to cost $1,718,633. (G.)

This estimate, as will be seen in the appendix, includes no allowance for land rights or fencing; but it computes the entire lockage above mentioned at $1,000 the foot lift, the slope walls at more than one dollar the perch, and these two items taken together, at more than a fourth of the entire sum above mentioned; while the heavier expenses of *excavation and embankment*, constituting, together, more than a moiety of the whole cost of the canal, are computed at more than the actual cost of the like items upon the part of the eastern section of the Chesapeake and Ohio canal already completed.

The average cost of more than three and a half millions of yards of embankment, exceeds eighteen cents, and of two millions of yards of excavation, twelve cents the cubic yard. On the western section of the great State canal of Pennsylvania, the reports of her canal commissioners show that every description of work was done on cheaper terms than on the eastern section. (H.) The preceding sum may, therefore, be considered as the maximum cost of so much of the western section of the Chesapeake and Ohio canal. With the liberal patronage of the United States, and such further aid as the State of Pennsylvania and individual enterprize within that commonwealth and elsewhere may afford, this sum will be, it is hoped, readily obtained.

Having completed one half of the portion of the canal between the western basin of the summit level and Pittsburg, there will remain but 27 miles of the other moiety of this distance to be provided for, in order to reach the mouth of Casselman's river, a point on the line of the canal in the vicinity of the Cumberland road. By the route of that road, this point is about 44 miles from Cumberland, the western termination of the eastern section of the Chesapeake and Ohio canal; by the route surveyed for the canal, about 67 miles; thirty-one of which lie between the mouth of Casselman's river and the western basin of the summit level.

It is apparent, therefore, that there will be several stages of this work where a pause may be made in its prosecution, without the loss of all benefit from the portion of it which will have been completed. To this view, may be superadded, the highly important consideration, that the part which may, at any time, have been accomplished, will afford increased facilities for the more speedy and economical construction of the residue, and, in the interim, will contribute, by its profitable use, to the advancement of the public wealth and the general revenue of the company.

Your memorialists having explained the motives which prompted the adoption of a plan of such enlarged dimensions for the eastern section of the canal, beg leave in order to obviate objections to the immediate commencement of the western section, to return to the estimate of the probable cost of the former. With the view of shewing the competency of the funds, on which a reliance has been hitherto had for the completion of this section of the canal, they proceed to demonstrate, or render probable at least, the truth of their statement, as to the proportion which the cost of the part of this section now under contract, being that to the east of the "Point of Rocks," may be expected to bear to the greater portion extending to the west of that point, and east of Cumberland, along which their progress has been hitherto obstructed. For this purpose they add to the statements of the last annual report, the following considerations:

Not only have the provisions hitherto consumed on the canal been transported a considerable distance, but nearly all the hydraulic lime for its costly aqueducts and its numerous locks and culverts, has been obtained from the New York canals, or from the Potomac quarries near Shepherdstown, 25 miles west of the "Point of Rocks," along a navigation so obstructed as sometimes to double its prime cost at the kilns on the river shore. Much of the stone for this masonry has been alike transported, and no small part of it by land for great distances, and at great expense. Two dams, one of them exceeding half a mile in length, have been required across the widest part of the Potomac, to force the water of that river into the necessary feeders; and the expense of their construction, as well as of two considerable aqueducts, and of 28, of the 72 locks, required on the eastern section, are comprehended in the estimated or actual cost of the 48 miles of canal next below the "Point of Rocks."

Two other causes have powerfully contributed to swell the expense of the work already executed. The usual ill heath, for a certain season of every year, of the valley of the Potomac, below the Kitoctin mountain; and the competition for labor on the canal, with two considerable works, the Baltimore and Ohio rail road and the Susquehanna and Juniata canal, of Pennsylvania; the former approaching very near, and the other not one hundred miles distant from the line of the Chesapeake and Ohio canal. Both causes have conspired for two years past to raise the wages of ordinary labor very far beyond the price anticipated, when the estimates of the Washington convention were made. One of these causes will, in a great measure, cease, after the canal shall have ascended the Potomac to the healthy country above the "Point of Rocks;" and the final completion of the great State canal of Pennsylvania, will shortly limit the operation of the other.

Without taking into account the probable reduction of the prices of materials and subsistence, as well as of the wages of labor in the more fruitful country above the Kitoctan mountain, your memorialists are sustained, as well

by experience, as by a comparison of the relative difficulties that were to be encountered by the canal, below and above the Blue Ridge, in computing the cost of the first 60 miles, between Georgetown and Harper's Ferry, at much more than a third of the entire expense of the eastern section of 186½ miles.

For the cost of the twelve miles of this distance, immediately below Harper's Ferry, not already placed under contract, they rely on the frequently repeated estimates of practical engineers, corrected by a reference to the price of that part of the remaining 48 miles actually placed under contract, and, at this time, either completed, or very nearly so. No part of these twelve miles, nor of the 126 miles above them, presents obstacles, as difficult to surmount, as those which have been successfully encountered on the part of the eastern section already finished. The twelve miles next above the Kitoctan mountain, and below Harper's Ferry, comprehend but a single dam across the Potomac, at a place where the river is much narrower than either at Seneca or the Little Falls; and there are, in this space, but three lift locks to be added to the 28 below the "Point of Rocks."

Assuming, therefore, the present enlarged plan of the Chesapeake and Ohio canal to be the permanent basis of the dimensions of the entire eastern section, and computing the total cost of the section at near thrice the actual cost of the 60 miles next above Georgetown, and about five millions of dollars will be found to be the sum required to reach the town of Cumberland. From this estimate, the work within Georgetown is excluded, under a conviction that the mole and basin at the mouth of Rock creek will repay all the expenses incurred there, except on the locks. As these would have been required to descend to the tide, had the canal stopped above this town, they are comprehended in the preceding estimate (I).

Of the five millions thus required, three millions six hundred and ten thousand dollars have been already subscribed, in the proportions of one million by the United States, a million and a half by the District cities, half a million by the State of Maryland, and six hundred and ten thousand dollars by private individuals; leaving the residue, to be yet provided, about $1,390,000.

Of this residue, your memorialists have always confidently expected to receive, at least a moiety, from that State, which, of all the parties to their charter, is most deeply interested in its object, from the very extensive inland navigation and commerce which she has dependent on its completion. (K). This expectation remains unimpaired by the delay which has hitherto disappointed its fruition, since that may be ascribed, it is believed, to causes transitory in their nature. A part of the above sum, your memorialists have sought to derive from such a modification of their charter, as should enable them, by selling either or letting the surplus water of the canal at such places and to such extent as, without any injury to its navigation, would bring into use this otherwise dormant source of convenience and profit, as well to the community at large, as to the Chesapeake and Ohio Canal Company (L). For any deficiency which may remain to be supplied, after exhausting all these resources, it is supposed that an appeal might, at any time, be successfully addressed to private enterprise, and to those important local interests involved in the successful accomplishment of this great national undertaking.

In this view of the resources, present and future, of the Chesapeake and Ohio Canal Company, no reliance, it will be seen, is had, for the completion of the *eastern section* of the canal, on a further application for pecuniary aid to the Congress of the United States.

For the mountain, or middle section, over which the Chesapeake and Ohio Canal Company are authorized to construct, either inclined planes and railways, or a continued canal, your memorialists have, however, never ceased to indulge the confident hope of assistance from that Government, which, created for the purposes of union and commerce, cannot be insensible to the claims of both these great interests upon the vigorous exercise of its powerful energies to remove every impediment to the easy intercourse of the Atlantic and western States through the centre of their common territory, and the seat of their common Government.

A plan for effecting this desirable object, has already received the approbation of your memorialists, and was sustained in an application to the President of the United States, on a recent occasion, by a large proportion of your honorable body. The doubts expressed by the Chief Magistrate of his power to employ the army on works of internal improvement, if still existing, it would, it is presumed, be in the power of Congress to remove in conformity with the past usage not only of other Governments, but that of the United States, and the earnest recommendation of the Department of War to the House of Representatives in the second year of Mr. Monroe's administration (M). Should it be your pleasure to give that direction to the labor of a part of the public force, which that recommendation enforced, and the annexed letter suggests, there will remain to be provided for, only the portion of the western section of the canal lying between the Alleghany mountain and Pittsburg; and, *for this portion*, the present appeal is most respectfully addressed to the enlighted patriotism of the representatives of the States and people of America.

Should the western section of the canal be retarded in its progress from Pittsburg towards Cumberland, by a suspension of it for any considerable period, at any one of the points suggested above; should it, for example, be prosecuted no farther than the mouth of Casselman's river, it will, even there, have arrived within a few miles of the national road, which already connects the Yougheogany, at Smithfield, with the Potomac, at Cumberland. Through the application of the various mineral treasures, apart from the productions of the agriculture, and the forests of the country between Smithfield and Pittsburg, a part of the resources for the completion of this section, would be speedily developed by the canal itself. It is, therefore, believed that, if a subscription be authorized by Congress for this purpose, to the extent of a single million, it will elicit a capital sufficient to defray the cost of all this central communication, except *its summit level*, and the descending planes or locks which are designed to connect *it* with the lines of continuous canal, stretching to the east and west from the base of the Alleghany mountain.

To open, through this great barrier, from the gulf of Mexico to the Chesapeake bay, an easy avenue of trade and intercourse to millions born and unborn, is, of itself, a work of such magnitude, as to require that it be commenced and prosecuted on a plan of *suitable dimensions* and with *adequate resources* for its speedy completion. It is for the Federal Government to sanction the one, since it is probable that it is, alone, competent to provide the other.

Your memorialists forbear, for the present, to enlarge upon this topic, and would here close the appeal, which they have presumed to make, to the wisdom of Congress, in behalf of the western section of the canal, if they were not imperiously required, by a report of a former committee of the

House of Representatives, to consider and to remove an objection to their whole enterprize.

To the memorials of the numerous citizens of Pennsylvania, who prayed for the aid of the General Government towards the construction of the western section of the Chesapeake and Ohio canal, the Committee on Internal Improvements, to whom these memorials were referred at the first session of the last Congress, replied, "that they duly appreciate the great and national importance of a communication between the western waters and the navigable waters of the Chesapeake bay, as is manifested in their report of the 19th of February, 1830, on the memorial of the Baltimore and Ohio rail road company."

The committee further stated, that, actuated by the same "desire, of affording to the Government a satisfactory *experiment* upon which it can decide, whether a preference ought to be given to a canal or rail road, as the mode of conveyance over the mountains, they deem it inexpedient, at present, to make the appropriations, as the western communication, in the opinion of the committee, should correspond with the one leading over the mountains."

Such, your memorialists beg leave to remark, had not been the course of Pennsylvania, who is proceeding to connect, by a rail road of about 40 miles extent across the Alleghany, her Conemaugh and Juniata canals; nor that of the Hudson and Delaware Canal Company, who combine a railway of 16 miles, overcoming an elevation and descent of 1768 feet, with a canal exceeding in length one hundred miles, in order to reach the Lackawannock coal mines from the north river; nor of the "Lehigh Coal and Navigation Company," who, for a similar purpose, have connected a canal and still-water navigation of 46 miles on the Lehigh, with a rail road of 9 miles, between Easton, on the Delaware, and Mauch Chunk. This last mentioned work overcomes, by its railway, a descent of more than 700 feet, and has, in a distance of 46 miles of mixed navigation, 47 lift locks, 6 guard locks, and 9 dams. The use, moreover, of its railway, long preceded, in point of time, the commencement of its canal.

Your memorialists aver, that at no period whatever, either before or since the prosecution of the great enterprise in which they are engaged, have they been unmindful of the progress of the science of internal improvement, either in Europe or America. Apart from the sudden, and to them most unexpected opposition of the Baltimore and Ohio Rail Road Company, to the construction of the Chesapeake and Ohio canal, along the route so frequently surveyed, and so long appropriated by so many indications of public opinion, for its use, every motive of personal interest, as well as of public duty, prompted the friends of the latter to institute a just comparison between those two modes of internal communication.

While the proceedings of the founders of the rival enterprise of Baltimore disclosed the grounds of their preference of a communication with the west, by *a direct rail road*, rather than by the course of the Chesapeake and Ohio canal, along the winding valley of the Potomac, the friends of the latter had no motive to deceive themselves or others. If such a communication were likely to supersede the use of the canal, while the former kept its avowed direction, and could not possibly interfere with the latter, the undersigned had not the *power* to arrest its progress, had they ever felt or manifested the disposition (N) They accordingly consulted all the information which the essays of scientific writers, or the actual experience of Eu-

rope or America could supply, in relation to the relative advantages of these different modes of transportation. They not only availed themselves of the reports of incorporated companies, the matured judgment and counsels of practical civil engineers, but carefully inspected all the materials for a correct decision upon this interesting subject, which the advocates of the *direct railroad* from Baltimore to the Ohio could, themselves, supply. (O)

These enquiries ended in a conviction, which remains to this day unshaken, that such a canal, as they have planned and partly executed, will furnish a much cheaper mode of transporting the heavy products of American industry, than any railroad whatever, and especially than one, the cost of which shall not very greatly exceed that of the Chesapeake and Ohio canal. In this opinion, they are fortified by all the recent information which they have been able to obtain from Europe, or in America, as well as by the continued practice of various incorporated companies, and States of this Union. Let it be remarked, that, not a single canal in Europe or America has yet been converted into a railroad; that from those very railways in America, on which reliance was early had to establish the superior advantages of railroads over canals, abundant testimony has been obtained to disprove the truth of this position, while the reference, so often repeated, to the experiment now in progress between Liverpool, the chief western port of England, and Manchester, her greatest inland manufacturing town, through her richest and most extensive mineral and manufacturing district, if it manifests any thing at all conclusive, on this subject, demonstrates the utter unfitness of this species of communication to the very uneven as well as unimproved surface of the country, between the tide of the Atlantic and the Ohio, and to the present condition of the wealth, arts, and population of the United States.

The construction of this road, about 30 miles long, has been the labor of six years, attended with the cost of about $140,000 a mile. Its highest elevation above tide water is 140 feet; its patrons originally proposed by it, to reduce the cost of transportation between Liverpool and Manchester, from 15 shillings sterling a ton, to 10 shillings, or eight cents a ton per mile—a price which, when compared with the average cost of carriage on the canals of the United States, exceeds the latter in the proportion of three to one. Persons are hired along the margin of this road to sweep the dust from the rails, to give signals of accidents, and after all, a report of its proprietors acknowledges that the wear and tear, both of the carriages and road, surpassed greatly their early anticipation.

In conformity with the sober and deliberate conclusions of experience, from known facts, is not only the past, but the still continued practice, as has been intimated, of the most enlightened States of this Union, in all cases, where canals are practicable, and no narrow interests, or local jealousies have arisen to obstruct their execution. New York, Pennsylvania, Connecticut, and Ohio, may be confidently cited to sustain this authoritative appeal to experience.

A report on the long contemplated and much desired union of the waters of the Delaware and the Raritan, adds to these authorities the weight of the commonwealth of New Jersey, whose proceedings in connecting the waters of her rivers, have been marked by so much prudence and circumspection. In the language of the committee, to whom was referred the subject of the Delaware and Raritan canals, addressed to the House of Assembly of that State, in January, 1829, in answer to the suggestion that "there is time

enough to profit by additional experience," your memorialists admit that "science is daily improving," but, like the authors of that able report, they are not willing, and they trust, that they shall not be required, to delay a great national enterprise "till time ceases to shed new light," and "science pauses in her career." "*Time* is money," and "*time stops for no man*," are maxims applying with peculiar force to all such enterprises. The Chesapeake and Ohio canal, the long contemplated object of unceasing solicitude and unwearied labor, can be completed, in five, as readily as in fifty years. On the other hand, the *experiments* of the relative utility of railroads and canals, which have already occupied more than one-fourth of a century, are still, it would seem, regarded as inconclusive. Many years would yet be required, and much capital of necessity be wasted, were the particular experiment instituted, which the Committee on Internal Improvements of the last Congress proposed, before it would be definitely settled, by the comparative expense, for a series of years, of the annual repairs of the Baltimore and Ohio railroad, and of the Chesapeake and Ohio canal, to say nothing of their original cost, and their annual receipts. As the one deterioated, it might be found that the other improved, from use (P.) The very question, so often triumphantly urged on one side upon the public notice, touching the relative speed of transportation, along two such lines of communication, could be fairly tested, only *by the long continued use of both*, with equal amounts of tonnage. That railroads should be constructed in Great Britain, where canals have so long afforded a monopoly of enormous profits, and have, in fact, appropriated to themselves almost every stream capable of being diverted from its natural channel, to their support, furnishes no very conclusive argument in favor of their superiority in America, a country in which the navigation of so many considerable rivers yet remains to be improved. Nor is the advance of the prices of railroad stock, in England, to fifty, or even to one hundred per cent. above par, at all more conclusive on this point; since, in the very same money market, canal stocks are still, in some cases, a hundred, in others a thousand, and even two thousand per cent. above par.

The time, though remote, may, possibly will, arrive in America, when *mere speed of transportation* will warrant the very heavy cost of constructing railways of such graduation, and of so many different tracks, as to admit of various velocities, for persons and property, moving at the same time in opposite directions; and of the substitution, on each of those tracks, of locomotive, or even of stationary steam engines, of various powers, for animal labor. When this period does arrive, it will be time to legislate for it; until then, it is demonstrable that canals cannot be profitably turned into railroads.

With one other view of this subject, your memorialists will conclude this protracted appeal to the consistency, the justice, and the liberality of Congress. In asking the subscription which Congress has already granted to the Chesapeake and Ohio canal, it should not, if it could, be forgotten, that much reliance was had on the subsisting relation between the Legislature of the Union and the cities and people of the District of Columbia.

Separated from their parent States, in compliance with the earnest wishes of those States, and a solemn provision of the Constitution of the U. States, they claimed a right to ask their exclusive Legislature to extend to them the fostering care of a paternal government. Unwilling to call upon that Government for aid, without manifesting the inclination as well as the ability to assist themselves, they have supplied to the stock of the Chesapeake and Ohio canal, by their corporate subscriptions, and by loans, which they were

empowered by Congress to negociate in Europe or America, a million and a half of dollars: and, to this large amount, they have superadded, by individual contributions, half a million more. (S.)

The whole value of their subscribed stock, as well as their ability to meet the solemn engagements into which they have entered, must mainly depend, it is evident, on the completion of the great national enterprise, to which these large contributions are devoted.

When those subscriptions were made, the route of the Chesapeake and Ohio canal, throughout its entire course, from Washington to Pittsburg, had been repeatedly designated, twice by skilful engineers, acting under the authority of the President of the United States, sustained by the resources, and countenanced by the approbation, of Congress, whose subscription of a million of dollars was founded on the evidence afforded, by those surveys, of the practicability, the cost, and the expediency of the entire route. No mere *experiment* was *then* proposed to settle the *relative merits of railroads and canals.* On the contrary, the subscriptions of all the stockholders of the Chesapeake and Ohio canal, as well as of the United States, were grounded on an implicit faith in the authority to locate the canal along the left bank of the Potomac: in the estimated cost of its completion, conformably to that location; and in the profit to be derived from its continuous prosecution, except in the mountain region between Cumberland and the mouth of Casselman's river. Between those points, and those points alone, a connexion, either by water or by inclined planes and railways, is expressly left open by their charter, to the future decision of the stockholders. It is not difficult to determine that no such subscription would have been made by the United States, by the States, the Corporations, or the individuals, associated in this great work, if it had been even suspected, at that period, that this line of continuous navigation was to be regarded *as an experiment*, or would be liable to be broken, in the midst of the valley of the Potomac, by the interference of a rival enterprise, seeking its destruction in order to appropriate its expected profits to another undertaking, and its commerce to a different market.

These views are forced upon your memorialists by the report to which they have referred. They are here reluctantly, but most respectfully, presented to your consideration, in full confidence that the Congress of the United States will do that which, to their wisdom, shall seem just, towards the States immediately interested in the object of this memorial, to the Union at large, to a district set apart for the seat, and, as such, an institution of its common Government; and to a people whose prosperity, security, and happiness, the federal Constitution has confided, exclusively, to their guardianship, protection, and care.

Signed by order of the President and Directors, and in their behalf.

C. F. MERCER,
Pres't Ches. and Ohio C. Comp.

December 3, 1831.

APPENDIX.

(A.)

Resolution of the General Meeting of the Stockholders of the Chesapeake and Ohio Canal Company, 29th September, 1829.

And be it further resolved, That the President and Directors be instructed to ask the State of Pennsylvania and the Congress of the United States for subscriptions of stock to the Chesapeake and Ohio canal, with a view to the commencement of the western section thereof; and, of the former, such further aid to the same object as, in their wisdom, they may deem it expedient to afford; and that the said President and Directors obtain, from the several parties to the charter of the company, such a modification thereof as may authorize them, with such funds and aids as may be acquired for that purpose, to commence the western section of the Chesapeake and Ohio canal before the completion of the eastern section thereof; provided that such commencement be not made without the special agreement of the stockholders, expressed in a general meeting, called to consider the expediency thereof, or in one of the annual meetings of the company.

(B.)

From the report of Messrs. Geddes and Roberts, communicated to the House of Representatives on the 16th March, 1828, being document No. 192, of the 1st session of the 20th Congress, two eminent civil engineers, who surveyed and estimated the cost of the eastern section of the Chesapeake and Ohio canal, for 186 miles above Georgetown, under the authority of the President of the United States, it will be seen that they make the distance between Georgetown and the turnpike road passing from Hagerstown, through Hancock, to Cumberland, 118½ miles, and come in contact with that road five miles below the town of Hancock. These five miles, they estimate at $85,393 88 cents for a forty foot canal. Adding their usual advance for its enlargement to 60 feet, and their estimate would reach $100,000, exclusive of contingencies, or $22,500 a mile. The eight sub-divisions below Licking creek, in length 118½ miles, according to their estimate, would cost $2,515,786 53, adding the usual allowance for contingencies, $2,767,365 18; so that, to reach Hancock, would require $2,877,365 18. The estimate, in this memorial, for a canal of the same plan in almost all other respects, but one foot deeper, and with aqueducts of solid stone masonry instead of wooden trunks, is $3,600,000, or the total capital stock at present of the Chesapeake and Ohio Canal Company. This estimate allows about $28,500 the mile for the cost of the first 123 miles of the canal, and supposes it to maintain throughout that distance its enlarged dimensions. The 68 miles of canal between Hancock and Cumberland, these engineers estimated at $1,585,290, or about $25,000 a mile.

As it is probable that, on approaching Hancock, or on passing the Great Cacapon, a considerable branch of the Potomac six miles above Hancock, it may be found expedient to reduce the dimensions of the canal to 50 feet, the above estimate, designed for a canal 60 feet wide, may be safely regarded as sufficient in amount; so that the total cost of the eastern section may, with some degree of confidence, be expected not much to exceed $5,000.000, even should it maintain its enlarged dimensions from Harper's Ferry to the mouth of the Great Cacapon, or for 129 miles from Washington.

In the plan and estimate of this section, submitted by the United States' Board of Internal Improvement to the President of the United States, in October, 1826, and by him communicated to Congress in his message of the 7th of Dec. in the same year, the United States' engineers say, "that the breadth at bottom is 33 feet, at surface 48 feet, the depth of water 5 feet, the tow path 9 feet wide, the guard banks 5 feet at the top, the surf berms on the level of water two feet wide each, the tow path and top of the guard bank two feet above the surface of the canal; this transverse section is to be modified where local circumstances require it, and more especially in the cases of deep cutting, steep side cutting, embanking, and also where the canal is supported by walls."

"The depth of five feet has been preserved throughout the line, but the breadth has been often much lessened."

The first 186 miles of this canal, extending from the Market street of Georgetown to Cumberland; the same report estimated, exclusive of contingencies, at $8,177,081 05. Among those contingencies, which embrace engineers' and officers' salaries, fees of counsel, expenses of printing, the cost of land rights has alone been found to exceed 1,000 dollars the mile.

In commenting on this estimate, a committee of the House of Representatives, in a report of the 30th of January, 1827, referring to the proceedings of the Chesapeake and Ohio Canal Convention, state it to be their opinion, that the eastern section of the Chesapeake and Ohio canal may be extended to the coal banks of the Alleghany, on the enlarged plan recommended by a bill which they report, (with a breadth of sixty feet in easy cutting, and a depth of five feet only) for less than 5,000,000 of dollars.

The Central Committee of the Chesapeake and Ohio Canal Convention, in their report of December, 1826, on this estimate of the United States' engineers, after much reasoning, come to the following result:

"In an estimate, believed by the committee to exceed in amount the probable cost of this section of the canal, they have reduced these specific expenditures to 5,000,000 of dollars, allowing, as part of that sum, $400,000 for unforeseen contingencies."

Instead of the above dimensions, however, the Chesapeake and Ohio Canal Company have extended the breadth of their canal, at the water line, to 60 feet, at the bottom to 42 feet, and its depth to 6 feet, its tow path to 12 feet in breadth, and its berm bank to 8. They never reduce that depth, and very seldom, and for very short spaces only, the breadth of their canal, in encountering any obstacles. It has, no where above Georgetown, less than the greatest breadth given by the United States' engineers, and much oftener exceeds sixty feet than falls short of it. Comparing the two canals, the cross section of the canal recommended by the United States' engineers contains 202.5 square feet; that of the canal actually constructed by the Chesapeake and Ohio Canal Company, 396 square feet: the contents of a mile of the water prism of the former is 39,600 cubic yards, of the latter

59,840. The contents of the larger exceed those of the smaller canal in a ratio of very near 3 to 2; but the calculation of the Central Committee of the Convention, having been applied to the smaller of these canals, and having amounted to 4,600,000 dollars, exclusive of contingencies, cannot be considered as deceptive or illusory, if the actual canal, above Georgetown, be constructed as far as Cumberland on its present very enlarged plan, for a sum very little exceeding 5,000,000 of dollars. It is proper here to remark, that the locks proposed by the United States' engineers were to be 104 feet by 14, in the clear; while those of the Chesapeake and Ohio canal are 100 feet by 15. All the culverts and aqueducts are of solid masonry, laid in hydraulic lime; and the locks are so constructed, by lengthening the side culverts, and multiplying their outlets, as to be passed, it is believed, in less than half the time computed by the United States' engineers.

In the ten miles, already executed, between the Great and Little Falls, of the most difficult part of this entire line of canal, a reduction has been effected of the estimated cost, by the Board of Internal Improvements, of 20,000 dollars a mile; which, on 186 miles, would be $3,720,000, or near $720,000 more than the entire reduction here anticipated. This may be accounted for from the fact, that, while 48 feet was the breadth proposed to be generally preserved by the United States' Board of Internal Improvement, they made due allowance, in their estimate, for a reduction below that breath, wherever deep cutting, rock excavation, and steep hill side cutting were to be encountered The actual canal, on the other hand, is seldom reduced below 50 feet, and its cost, below the Little Falls' feeder, generally exceeds the estimate of the United States' engineers, as the breadth of the canal is there extended very far beyond its usual dimensions. This augmented cost is expected to be replaced, by the surplus water thus brought within the reach of the company, just above Georgetown, on very favorable ground for its application to manufacturing purposes.

These explanations are designed to remove the unfounded impression, that the present estimate of the cost of the Chesapeake and Ohio canal varies essentially, from that, on which the former subscriptions to its stock were grounded. Nor is it at all more difficult to reconcile to the present estimate the actual cost of this canal, so far as it has progressed.

It is conceded that the construction of the 60 miles next above Georgetown will average $30,000, possibly $33,000 a mile; but it is still believed that the entire cost of the eastern section, exclusive of the work *in Georgetown*, will not much, if at all, exceed $5,000,000—the former estimate, as has been seen, of the Central Committee.

To reimburse the expenditure in that town, reliance is had on the sale of the mile constructed at the mouth of Rock creek, which is in length 1,057 feeth, and in breadth 160 feet; affording the necessary ground for a range of warehouses eighty feet deep; fronting, at one end, a wharf of forty feet breadth, along the basin in which the canal boats will lie; and, at the other end, another wharf, as spacious, along the river, where ships of heavy burthen may securely float in twenty feet water.

In the estimate which carries the cost of the 60 miles of canal between Georgetown and Harper's Ferry to $1,800,000, possibly $2,000,000, the twelve miles between the Point of Rocks and Harper's Ferry are computed at 250,000, or about 20,000 dollars a mile, after allowing 10,000 dollars for the feeder and dam across the river, immediately below the mouth of the Shenandoah.

This sum exceeds, in the aggregate, the estimate of the cost of this work, made, pursuant to an order of the President and Directors, by a resident engineer of the company, preparatory to placing this part of the canal under contract, and after the acquisition of much experience in the construction of the works below the Point of Rocks.

In the earlier proceedings of the friends of this great national enterprise—in that convention which assembled in Washington on the 6th of November, 1823, when it was contemplated to construct a canal, not exceeding in dimensions the Erie canal of New York, the cross section of which is but 1 36 feet, the estimate of the cost of the part of the eastern section of the Chesapeake and Ohio canal above the old locks, at the Little Falls of Potomac, was estimated at 2,750,000 dollars, and expected to be raised by subscriptions of stock in the proportion of $1,000,000 by the United States, $750,000 by the State of Virginia, 500,000 by the State of Maryland, and 500,000 by the three cities of the District of Columbia. Except the still expected subscription of Virginia, these sums have been already subscribed: the subscriptions of the District corporations have been trebled, and 610,000 dollars added, by the subscriptions of private citizens.

The annexed table will be found, with the letter preceding it, in Report No. 141, of Feb. 11, 1828, from a committee, to the House of Representatives. It compares the various estimates of Messrs. Geddes and Roberts, and the United States' engineers, throughout the 11 sub-divisions into which they concurred in distributing the eastern section of the Chesapeake and Ohio canal.

ENGINEER DEPARTMENT,
Washington, February 8, 1828.

SIR: I have the honor of transmitting to you, herewith, a copy of "an estimate of the cost of a canal to be made along the Potomac valley, on the Maryland side, from Cumberland to Georgetown," which was handed to me by Judge Geddes last night, as the result of the labors of himself and Mr. Roberts; and have the honor to be, with great respect, sir, your most obedient servant,

ALEX. MACOMB, *Maj. Gen. Chief Engineer.*

To the Hon. CHARLES FENTON MERCER,
Chairman of the Committee of Roads and Canals,
House of Representatives.

Estimated cost of a Canal to be made along the Potomac valley, on the Maryland side, from Cumberland to Georgetown.

Subdivisions.	Miles.	Yards.	A canal of 40 feet surface, and 4 ft. deep.	*A canal of 48 feet surface, and 5 ft. deep.	*A canal of 60 feet surface, and 5 ft. deep.	*Added by the Committee.* The same subdivisions, estimated by the U. S. Engineers for a canal 48 feet wide and 5 ft. deep.
1	16	1,692	$320,439	$345,644	$355,558	$ 524,880 54
2	36	533	826,314	879,897	903,794	1,464,372 97
3	17	455	250,759	281,343	296,993	413,794 20
4	16	1,529	422,025	436,765	444,121	942,386 50
5	30	257	647,653	692,660	714,867	1,572,898 54
6	9	1,099	204,492	222,267	229,029	747,781 10
7	17	1,146	201,759	231,210	246,913	496,262 00
8	19	1,131	191,607	228,013	247,176	511,900 40
9	8	1,100	161,063	176,176	182,847	429,868 40
10	11	933	326,107	347,570	354,973	897,650 80
11	2	278	91,422	100,000	100,000	175,285 60
			3,643,640	3,941,545	4,075 571	$8,177,081 05
Add 10 per cent. for contingencies -			364,364	394,154	407,557	
			$4,008,004	$4,335,699	$4,483,128	

*This enlargement, it is understood, extends to 126 of the 186 miles.

(C.)

Extract from an act of the State of Pennsylvania, entitled "An act incorporating the Chesapeake and Ohio Canal Company." Passed 9th February, 1826.

Sec. 5. *And be it further enacted, by the authority aforesaid*, That, should the United States of America subscribe to the stock of the said Chesapeake and Ohio Canal Company, the said company shall, within six months after receiving the sum subscribed, commence the western section of said canal, at such point or points as may be deemed most advantageous to the interests of the said company; and it shall be their duty to apportion at least one half of the subscription of the United States to the western section of the said canal. And whatever amount of stock may be subscribed by the citizens of Pennsylvania, shall be expended wholly on the western section, unless authority is given to the said company, by the Pennsylvania subscribers, to expend their subscriptions differently; and, in case of failure of the said company to comply with the provisions herein set forth, this act shall cease to have any force or effect whatever.

(D.)

An act to amend the charter of the Chesapeake and Ohio Canal Company, by authorizing the commencement of the western section of the canal. Passed February 13, 1830.

Be it enacted by the General Assembly, That, whenever a majority, in interest, of the stockholders of the Chesapeake and Ohio Canal Company, shall, at a general meeting thereof, determine that it is expedient to commence the western section of the said canal, they shall have power to authorize and require the President and Directors of the company to cause the same to be begun, although the eastern section of the said canal shall not be, at such time, completed.

Be it further enacted, That the said President and Directors shall have authority, at such times and places as they may deem expedient, to open books for a conditional subscription to the stock of the said company; such condition to be, that the stock, so subscribed, shall be applied, exclusively, to the eastern or to the western section of the canal, as the subscribers may respectively prefer and direct. And, in the event of any such subscription being obtained, the said President and Directors, to the extent thereof, at least, shall apply all sums paid thereon, according to the terms of the condition annexed thereto, by the respective subscribers; and to no other purpose whatever. In all other respects whatsoever, the stock so subscribed shall be regarded as part of the general stock of the company, and entitle the stockholders subscribing the same to the same rights and privileges, and subject them to the same obligations with the other stockholders, whose subscriptions are payable without condition as to their application to either section of the canal.

And be it further enacted, That no forfeiture of the charter of the said company, or of any right thence arising, shall be incurred by any delay on their part, to complete the western section of the said canal, by reason of a commencement of the same before the completion of the eastern section

thereof, but the longest time shall be allowed the said company for the completion of the entire canal, which could lawfully be claimed by them in virtue of any delay of the commencement, or completion, of the western section of the canal, authorized or permitted by the terms of their present charter.

Be it further enacted, and it is hereby declared, That the amendments to the charter of the Chesapeake and Ohio Canal Company, contained in this act, are made upon the express condition that no part of the capital stock in said company, heretofore subscribed, shall in any manner be applied to the construction of the western section of said canal until the eastern section is completed, but the same shall be altogether applied to the construction of the eastern section thereof, until the same is completed.

This act shall commence and take effect, as far as regards this Commonwealth, from the passage thereof; as regards the United States and the State of Maryland, on receiving the assent of the Congress of the United States and the General Assembly of Maryland thereto; and on its receiving the further assent of the Legislature of the State of Pennsylvania, shall be taken and deemed to be, in all respects, part of the charter of the Chesapeake and Ohio Canal Company.

A supplement to an act incorporating the Chesapeake and Ohio Canal Company.

Sec. 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, and it is hereby enacted by the authority of the same,* That the Chesapeake and Ohio Canal Company are hereby allowed an additional term of one year, for the purpose of commencing the western section of the said canal, beyond the time specified in the fifth section of the act to which this is a supplement; and that the charter of said company shall not be forfeited, if, within the time specified in said act, as hereby extended, the said company shall commence the western section of the canal, any clause or restriction in said act to the contrary notwithstanding.

FREDERICK SMITH,
Speaker of the House of Representatives.

WM. G. HAWKINS,
Speaker of the Senate.

Approved—April 2, 1831. GEO. WOLF.

Resolution relative to the Chesapeake and Ohio Canal.

Resolved, by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, That the Senators of this State in the United States' Senate, and the Representatives of this State in Congress, are requested to endeavor to procure the passage of a law authorizing the subscription of a million of dollars on the part of the General Government, to the stock of the Chesapeake and Ohio Canal Company, to be expended on the western section.

And be it further resolved, That the Governor be requested to transmit a copy of the foregoing resolution to each of our Senators and Representatives in Congress.

FREDERICK SMITH,
Speaker of the House of Representatives.

WM. G. HAWKINS,
Speaker of the Senate.

Approved—April 1, 1831. GEO. WOLF.

(E.)

Third Annual Report of the President and Directors to the stockholders of the Chesapeake and Ohio Canal Company, at their third annual meeting, on Monday, June 6, 1831.

On the 7th of June, 1830, the second annual report of the President and Directors disclosed to the stockholders the actual condition, at that period, of the various interests of the Chesapeake and Ohio Canal Company, embracing a detailed account of the receipts and disbursements of the funds of the company, and of the operations on the canal, from their commencement, in the Autumn of 1828, to the last day of the preceding month.

The President and Directors proceed to bring down this detail to the 31st of May, of the current year, and to superadd whatever information they can supply to the company respecting the general interests of the work confided to their charge.

From the subjoined table of receipts and disbursements, it will appear that, since the organization of the board, there has been paid into the Treasury the sum of $1,740,205 46, derived from the following sources: From the late Potomac Company, being the unexpended funds in the hands of that company at the time of its dissolution; from the Commissioners of the United States and the States of Virginia and Maryland, by whom the books were opened to receive subscriptions to the stock of the company, being the amount paid to them at the time of taking the subscriptions; from the stockholders on the subsequent instalments called for by the President and Directors; from tolls collected both before and subsequent to the opening of the new canal; from the sale of old houses, &c. which were upon the ground required for the canal; from materials sold, not required in the construction of the canal; from interest and gain on the sale of the Maryland stock; from interest and law charges recovered from delinquent stockholders; from two unexpended balances of money which had, in different years, been placed in the hands of the President for paying the amount awarded by the Jury, on lands condemned in Frederick county, and certain expenses in the suit of the Baltimore and Ohio Railroad Company against this Company depending, at Annapolis; and from a loan from the Corporation of Georgetown, in anticipation of future instalments.

Out of these receipts, there has been disbursed, for the construction, improvement, and repairs of the canal, including $1,953 25 paid for materials over and above those supplied by the contractors themselves, the sum of $1,539,521 33, leaving $200,684 13, to be otherwise accounted for.

Of this, the sum of $78,584 62 has been paid for lands required, either by the canal and its appurtenances, or to avoid the necessity of bridges or ferries across, or of viaducts beneath it.

The further sum of $71,273 63, part of the above residue, covers the three years' expenditure, including the pay, instruments, and contingencies of the engineer corps. Part of this expenditure, along with a sum of $4,026 08, and a part also of the sum of $5,053 24, expended for stationery, postages, and printing, including advertisements and notices, is chargeable to the completing of the survey, and the acquisition of lands for the future construction of the western section of the canal; making the total amount hitherto applied to that object $6,822 72.

Under the head of the Potomac Company, the sum of $2,749 81, has been applied to the repairs of the old canal and the pay of the keepers of the old locks at the Great and Little Falls; $5,089 45 have been disbursed under the head of law expenses, on account of clerks' fees, and the opinions and arguments of counsel; $166 95 have been disbursed on account of interest on sums borrowed, or received from subscribers in anticipation of instalments called for; the sum of $5 55 has been paid on account of dividends of the Potomac Company, hitherto unclaimed; $17,982 29 on account of the salaries of the officers of the company; and $5,494 35 for contingent expenses.

These various amounts leave the total receipts and disbursements of the three years, to be balanced by the deposites of the company in various banks, amounting, at the date of the last Treasurer's report, to $10,388 35, subject to a deduction of $130 19, overdrawn from one of those banks.

In aid of this sum, a further call upon the stockholders for 2½ per cent. on each share of subscribed stock, making in all 50 per cent. has been recently advertised. This, with the further aid of the outstanding balances of prior calls, will constitute a fund for the prosecution of the unfinished works of the canal under contract. Which fund may be aided by the sale of certain lands held by the company, to purchasers who will take them, with a release of any right to a bridge or a ferry across the canal.

At the period of the last year, corresponding with the present, 6,000 laborers, and 700 horses were employed on the canal. By the latest returns, the number of the former is reduced to 1,326, and of the latter to 276. Every week, the extent of the work to be completed is diminished, by the return of final estimates upon that which is done.

Till the month of November last, the only benefit afforded to the navigation of the valley of the Potomac, by the new company's works, was limited to the enlargement of the old canal around the Little Falls; and the sinking of two culverts beneath it; by which its frequent obstruction from the alluvial deposite of the adjacent hill sides, during heavy rains, was effectually prevented.

In that month, the canal from the intersection of the old, by the new line, up to the Seneca feeder, was opened for use. The heaviest embankments had been completed in a very dry season, and as on all new works of this description, the navigation was several times suspended by leaks and breaches, after the admission of the water, till the hard frost of January obstructed its use altogether.

The board availed themselves of this season, to let out the water, and to finish the deep and difficult rock excavation of the thirteenth and thirty-fourth sections, which had been left incomplete by the last contractors. Early in March, the navigation of the river was renewed by the breaking

up of the winter ice; but that of the canal, from Seneca to the Little Falls, awaited the completion of those sections, till the 21st of that month. Since then, its use has continued, with occasional but transient interruptions caused by slight breaches, improvements, and necessary repairs. The last have been required, on two sections chiefly, and in consequence of too much loose stone, having been permitted to be thrown and to lie together at the bottom of the canal, prior to its being levelled with compact earth.

Early in the late Spring, the navigation of the canal was extended a mile below the old locks, at the Little Falls; and, more recently, a mile farther, below the viaduct, a few hundred yards above, and within sight of Georgetown, whence a passage-boat carrying the United States' mail now daily plies as high up as Seneca, in connexion with two lines of public stages, which pass over to Leesburg, in Virginia, crossing the Potomac at Edwards' ferry.

The works between the present termination of the navigation and the basin next the tide lock, designed as a harbor for the canal boats, are in such forwardness, as to ensure the extension of the navigation during the present month, to the market house in Georgetown; and it is certainly possible, and therefore confidently hoped, that, by the approaching 4th of July, a boat may pass through the tide-lock in the mole erected across the mouth of Rock creek, by the summit of the Granite ridge, which runs out at Seneca, into the level of the feeder, entering the canal from the river, at the foot of the 24th lock above tide water.

The masonry of this and of the adjacent guard-lock, has been for some time finished, as is very nearly that of the next lock above it, and of the aqueduct of three arches across the mouth of Seneca, with which it is united.

Of the three locks, in the 25 miles of canal above Seneca, that opposite to Edwards' ferry, is nearly completed, and the two between it and the Point of Rocks, have their foundations laid, and so far built upon, as to ensure their completion in a few weeks.

The culverts on the same line of canal have long been placed under contract—several of them are finished—others are nearly so—and all have been begun with facilities for their construction, which justify the confident expectation that they will be done by the end of the present Summer.

The various sections yet unfinished, of which those works constitute a part, in length about 26 miles, are all either completed, or so far advanced as to assure their completion within ninety days from the time when the contractors shall be required to deliver up their contracts.

The aqueduct of seven arches, of fifty-four feet span each, across the Monocacy, has been three times let, the contract for its construction having been once abandoned, and once transferred by assignment. It is now in the hands of an efficient contractor, who, by the terms of his agreement, is allowed till November next for its construction. The red free stone first chosen for this work having proved defective, it is required to be built of a white granite, for the transportation of which, the contractor has found it necessary to construct a railway exceeding two miles in length. This stone is quarried with facility, but it is so hard as to require great labor to cut it, and the contractor has experienced delays from various accidents, not the least formidable of which, was the bad state of the road from the river to the quarry, which drove him finally to the construction of the railway, and the frequent freshes of both the Potomac and the Monocacy, which have since often arrested the progress of his masonry. The foundations of the piers

are laid and secured to the rock on which they stand; the abutments and several of the piers are ready for the centers, one of which is up, and the arch now turning upon it. A doubt, notwithstanding exists, that unless the ensuing Autumn shall prove more healthy than the last, this work will not be ready for the admission of the water through it before the end of the next Spring. That it will be then finished is confidently expected.

When done, the inquiry will arise, from whence is the water for this part of the canal to be had?

Various expedients have been suggested, and considered by the board, without a conclusive judgment having been formed on the subject.

Had the citizens of Frederick co-operated with this company, a branch canal of twenty-nine miles in length, conducting the Monocacy through their city, would have supplied this part of the main stem with water, from a level of about eight miles, next the Potomac, serving both as a feeder and a canal.

The board hesitated to construct such a work for the sole purpose of a feeder, since it might be dispensed with after reaching Harper's ferry, by the dam, immediately below which, the United States' engineer, and Messrs. Geddes and Roberts, also, proposed to supply this part of the main canal with water.

Another plan was submitted to the board. To erect a dam across the river below the Point of Rocks, of such elevation, as to raise the water about nineteen feet above its ordinary level, and, by a feeder, to force it into the canal; or, if preferred, to construct, at the same place, a dam of less height, and hydraulic machinery, to elevate the necessary supply of water to the level of the canal; and by ascending locks, to provide admission for the river boats.

Could the expense of the whole, or a part only, of such a work, be defrayed by the sale of the surplus water, which it would place at the disposal of the company, very little, if any, doubt could be entertained of the expediency of this temporary substitute, for a feeder, from the Shenandoah and Potomac, immediately below Harper's Ferry.

A third, and more limited suggestion, has been also considered, which, if adopted, could be speedily reduced to practical use; the introduction into the canal, of the Tuscarora, from above the Great Monocacy, and of the Little Monocacy, Broad Run, and several smaller streams from below, so as to provide a navigation less constant, but, at the same time, of much convenience to the adjacent country; and a quantity of water sufficient to fill the canal up to its intended level, so as to preserve its inner slopes from washing in hard rains.

The same spirit, which suggested these various substitutes for the extension of the canal above the Point of Rocks, where it has been so long impeded by the injunction of the Railroad Company, induced the effort, on the part of this board, to compromise with that company, so much of the ground of dispute between the two companies, as should enable both, in conjunction, to reach Harper's Ferry. For the origin, progress, and termination of that compromise, the board beg leave to refer to the accompanying printed correspondence.

It began, as is known to the President and one of the Directors of this board, in a tender by the President of the Railroad Company, of a compromise which he particularly desired should respect only the ground below Harper's Ferry, but which was finally extended with his consent and that of

this board, to Williamsport. It ended, as the correspondence itself will show, in a resolution of the President and Directors of the Railroad Company, to make no compromise, which should be limited, in extent, to a point short of Cumberland.

For the grounds on which the board refused to accede to this unexpected ultimatum, they beg leave to refer to the official letter addressed in their behalf, by the President of the Board, to a Committee of the House of Delegates of Maryland, and to the letters of the civil engineers, Messrs. Roberts and Cruger, written in conformity with their depositions, taken under a commission from the Chancellor of Maryland, to be read in evidence in the suit still depending at Annapolis.

To the objections, that the lines of interference between the two companies have, but their beginning, at the Point of Rocks, and that occupying two, out of the twelve miles below Harper's Ferry, they cover between Cumberland and the mouth of the Shenandoah 45 out of 126 miles: that, to re-survey and endeavor to adjust, in connexion, the location of the two works for all this distance, would, as their engineers proved, consume several years; enhance the cost, and augment the hazard of the canal; greatly impede, if not absolutely prevent its future repairs, and, according to the proposed plan of compromise, cut it off from all intercourse with the territory of Maryland above the Point of Rocks; might have been added, the same objection, in relation to the obstruction of the communication with Virginia; since, between its tow-path and the margin of the river over which the produce of that State must pass, in order to reach the canal, there would not, for several miles together, be space enough to land and transfer it to the boats; while, on the opposite or berm bank of the canal, converted into a railroad, the canal would be cut off from approach wherever the Baltimore company pleased to construct their railroad, as allowed by their terms of compromise, within eight feet of the canal.

Reluctantly yielding to the necessity imposed on them by the decision of the Chancellor on a motion to dissolve the railroad injunction, of submitting to a fourth survey of the line of the canal, the board attempted in vain to expedite that survey by multiplying facilities for conducting it, till, perceiving from its very nature, apart from the numerous obstructions to which it would be liable, that it must consume many years, and be accomplished, if at all, at great cost, they determined to rest the final decision of the company's rights, on the facts repeatedly manifested by the prior surveys of the same ground, made under high authority, and again demonstrated by more recent proof, that a canal and railroad could not be conducted in juxtaposition, along even the four very short, but difficult passes, below Harper's Ferry, without a reduction of the required breadth of its surface, the augmentation of its cost, as well as its hazard; and a diminution of its expected utility, and, consequently, of its future profit.

These effects were so fully disclosed by the evidence of Messrs. Roberts and Cruger, as to leave the Board no room to doubt but that the Chancellor would dispense with the farther prosecution of the joint survey, and decide the controversy between the two companies, on its merits, without further delay.

In this expectation, this board has not been disappointed. It is with great satisfaction, that they apprise the general meeting of a recent order granted, as they understand from their counsel, by the Chancellor of Maryland, requiring the commissioner, authorized nine months ago, at the in-

stance of the Railroad company, to take depositions in this suit, to return to court the evidence he had taken, and that the Chancellor had notified both companies that he will be ready to hear and decide their case upon its merits, on the 15th day of the present month, provided they are both prepared for trial.

One benefit, if no other, will result from this notice; the effect of which, it is understood, that either party may delay. It will supply a test of the sincerity of that declaration of the President and Directors of the Baltimore and Ohio Railroad Company, so often reiterated, that they desire a speedy termination of this unhappy, and to this company, a like unexpected and injurious controversy.

As the court of appeals of Maryland will sit in Annapolis in this month, if that shall not defer the expected trial in chancery, the acordance of the time of session of the two courts, may lead, by possibility, should there be an appeal from the Chancellor's decision, to a more speedy settlement of the depending controversy.

Besides the various expedients which have been stated, all more or less costly, of obviating some of the inconveniences arising from the impediments thrown in the way of the canal above the Point of Rocks, it has been recently proposed to the board, in anticipation of the speedy action of the tribunal of last resort, in this case, to take preparatory steps for completing the canal, on the ground, which they confidently believe the justice of Maryland will ultimately throw open to them. These steps would consist in immediately placing under contract the dam below Harper's Ferry, and the locks to be constructed between it and the Point of Rocks, that the materials of both may be in readiness, and the former progressing when the suit shall terminate. The dam will be required, whichever shore of the river the canal may ascend, and the stone prepared for the four locks, could be transferred according to the issue of the controversy, to the shore to which it may restrict the company, or to that which they have long since chosen, because of its south exposure, its more even surface, and the necessity it avoids of crossing the Potomac twice, and the Shenandoah once, by very expensive and hazardous aqueducts.

From the character of the canal already completed below the Point of Rocks, and especially of that part of it between the 11th and 33d sections, as well as in the vicinity of Georgetown, it must now be apparent that the early assurance given to the public, that the entire eastern section could be finished in three years from its commencement, might have been realized, provided no legal obstruction had impeded its progress, and adequate funds could have been provided.

It is as confidently believed, that nothing more is necessary, in order to manifest the superiority of the Chesapeake and Ohio canal, to any other mode of transportation applicable to the valley of the Potomac, than to bring it into actual use above the obstructions of that river, at Harper's Ferry.

The annexed tables, presenting an exhibit of the cost of each section of the canal, from the tide lock in the mole at Washington, to the Point of Rocks, and of the estimated cost of the twelve miles above that point, which remain to be constructed, in order to reach the mouth of the Shenandoah, will show that the work above Georgetown, done, and to be done, on the first sixty miles of the canal, will cost about 30,000 dollars a mile, exclusive of contingencies In one of those tables, a comparison is instituted between the actual cost of this work, and the estimate made of it by the United States'

engineers, who terminated their calculations at Market street, in Georgetown; where they proposed to form a basin, and to which, therefore, this comparative view is made to descend.

For the sake of any inference which may be drawn from this comparison, it should not be forgotten, that the breadth of the canal, at the water-line, was designed, by the United States' engineers, to be 48 feet, its bottom 33 feet, and its depth 5 feet; of which, they say, "this transverse section is to be modified, where local circumstances require it, and more especially, in the cases of deep cutting, steep side-cutting, embanking, and also where the canal is supported by walls. The depth of 5 feet has been preserved throughout the line, but the breadth has often been much lessened."

The actual canal, on the contrary, is 60 feet wide at the water-line, 42 at bottom, and 6 feet deep, and has been reduced in breadth, below these dimensions, though all the above contingencies frequently occur in its course, for less than a single mile altogether, of the 48 now very nearly completed. It is, indeed, much more frequently enlarged than reduced; it is never less than six feet deep; and where its breadth, as for the four miles next above Georgetown, is less than 80 feet, its depth is extended to seven feet below the top-water-line, forming a cross-section, throughout, of about 420 feet below water.

To compare these two canals together, the surface of their respective tow-paths and berm-banks being, with the same inside slope, two feet above their water-line, it should be considered, that their entire cross sections, or mean breadth, multiplied into their depth, are to each other as 432 to 304.6; and the cross-sections of their water-prisms, where the larger is only 6 feet deep, as 306 to 202.5.

The breadth of the tow-path of the larger canal is, also, constructed three feet wider than that required by the estimate of the smaller; the culverts of the larger are never reduced to a less length, than a canal of 60 feet breadth requires: all of them are constructed, where practicable, so high, as to enable a laborer to walk erect through them, and several are enlarged to dimensions which will permit loaded wagons, and all other conveyances for persons or commodities, to pass under them. The locks are four feet shorter than those recommended by the United States' engineers; but they are, at the same time, a foot wider and a foot deeper; and they are all constructed of cut-stone masonry, laid in hydraulic lime, without any use of common lime, except in the backing of a few of them, where, in the facing, the English Roman cement was freely used. Grubbing will be found not to have been included in the estimate of the United States' engineers, nor the incidental expenses of excavating and embanking the locks, constructing houses for lock-keepers, nor the necessary improvements developed, on opening the canal, by the admission of water. These items in the table swell the cost of the actual canal 110,000 dollars; on the other hand, the cost of but one permanent bridge, and an allowance of 4,400 dollars for that and the bridges above the Market-house in Georgetown, are included in the cost of the part of this canal above that town, and the cost of fencing, estimated by the United States' engineers at 54,900 dollars, although not included in the actual cost of the work, is comprehended, in part, in the indemnities awarded by juries, the compensation voluntarily agreed on, or the prices paid for the land purchased of the adjacent proprietors in behalf of the company.

The United States' engineers considered their estimate, moreover, as

possibly covering the usual allowance of five or ten per cent. for unforeseen contingencies—some of which are comprehended in the cost of this part of the actual canal, and others of which have been already noticed in this report.

As might have been expected from the enlarged dimensions of the area and embankments of the new canal, the quantities of the work estimated, and done, essentially and greatly vary. The cubic yards of embankment estimated by the United States' engineers, for the canal below Harper's Ferry, amounting to 748,580 yards, and, if the puddling be added, which does not seem, from the estimate of its cost, to have been designed to affect the quantity of the embankment, to 1,056,710 cubic yards; while the actual embankment, including the puddling, as the calculation requires, added to the estimated quantity of that remaining to be done, amounts to 1,753,571, exclusive of the embankments around the locks, which are separately charged in account, and amount to no inconsiderable quantity.

The excavation and the walling are, in quantity, nearly the same, though differing in cost near $740,000. The walling of the actual canal exceeds that of the estimated, less than 14,000 cubic yards, while the computed cost of the latter surpasses the actual cost of the former near $500,000. Ninety-six culverts are provided for in the estimate; eighty-one in the canal; but the disproportion between the aqueducts in breadth, arises from the different denominations given to them: the aggregate cost of both, on the two canals, varying less than 4,000 dollars, notwithstanding the much greater breadth of the larger canal, and the peculiar difficulties attending the construction of the aqueduct across the Monocacy, which surpasses in the size of its arches, and exceeds in length, as does that at Seneca, the dimensions for which an estimate is given by the United States' engineers.

The total difference presented by this table of the cost of these two canals, is, subject to the preceding explanations, 677,184 dollars, on an expenditure actual and estimated, of 1,848,941 dollars; and this, notwithstanding the great enlargement of the area and embankments of the cheaper canal.

These facts and comparisons are presented to the stockholders, and to the public, in no spirit of triumph over the very eminent, disinterested, and highly honorable engineers by whom the first estimate of this work was made; it is well known, and gratefully acknowledged, with no unfriendly feeling towards its future progress. This progress, indeed, their very errors are calculated to promote: for, having accustomed the public mind to so large an estimate of this work, they have laid the foundation of its ultimate success, by the contentment with its actual cost and plan, and, it is believed, with its construction also, which, whatever dissatisfaction may elsewhere prevail, must finally pervade its early and steady patrons, as well as the subscribers to its stock.—(See note A.)

This comparison will at least disprove, and such is one of its purposes, the allegation, recently repeated, after reiterated contradictions, that the actual cost of the Chesapeake and Ohio canal had not fallen short of that estimate by which the construction of its eastern section of 186 miles, ending at Cumberland, was made to reach $8,177,081 05, and its total cost to Pittsburg $22,375,427 69.

But, lest advantage shall be supposed to have been taken in the comparison just closed, either of the easier ground along the bottoms above Seneca and the Monocacy, or of the mere estimate of the work, not, as yet, begun, between the Point of Rocks and Harper's Ferry, the board especially in-

vite the public attention to the portion of the canal which is not only completed, but has now been in actual use for several months; and, of this, to the tenth sub-division, which extends from the head of the Great Falls to tide-water, at the old locks below the Little Falls.

The accompanying table, distinguishing the several sub divisions of the canal, from the 7th, beginning at Harper's Ferry, to the 11th, ending at the Market house in Georgetown, gives to the 10th a length of 11 miles 1023 yards in the estimate by the United States' engineers, and 10 miles 1005 yards in the actual canal between the same termini; a difference occasioned by a change of the location for about three miles and a half of the way. The difference of cost, after deducting from the estimate the computed expense of the locks transferred from the 10th to the 11th section, on this sub-division of the canal, largely exceeds 200,000 dollars. While the actual excavation and embankment, together, of the new canal, surpass, in quantity, the estimated quantity of earth and rock 124,000 cubic yards, the walling 27,463 perches, the actual cost of the three items is less, on the larger canal, than in the estimate for the smaller, by 265,985 dollars, although the embankment of the larger sub-division exceeds that of the smaller, in cost 56,747 dollars, and in quantity, including the earth puddled, in the ratio of very near two to one. If the quantity of puddling should not be added to the quantity of the earth estimated in this ratio, which is believed to be correct, then this ratio will be as 529,933 to 150,860, or will considerably exceed 3 to 1.

To guard against the supposition that this part of the canal passes over easy ground, here follows the description of it by the United States' engineers, in their own language, to be seen in the 49th page of a congressional document.

"*Sub-division 10th.* From the head of the Great Falls to tide, below the Little Falls.

Distance, 11¾ miles—descent, 173 feet—22 locks.

From Cumberland, 183½ 578 74

"The breaking of the Potomac through the granite ridge, at the Great Falls, presents, at first sight, difficulties of the greatest magnitude. The river gradually narrows its channel as it approaches its perpendicular pitch. At this point, and a little below, the width does not exceed one hundred yards, at a moderate stage of the stream. Here the perpendicular rock, 60 or 70 feet high, forming the banks, the deep water at their foot, the violence and great rise of the freshets, render truly appalling the idea of supporting a canal along this pass by means of walls. Most happily, there is no necessity for such a plan: a ravine, or rather two ravines, which can be rendered continuous by comparatively little labor, extend for the whole distance between what is termed Bear Island and the high bluffs forming the Maryland shore.

"This fortunate circumstance will not only enable to make the canal here at much less expense than through the pass of the stream, but it will also procure to the work a security which neither ingenuity nor expense could afford on the other alternative.

"Below the Great Falls, the ground, with the exception of some portions of easy execution, is generally difficult, requiring a large extent of walling and of steep side cutting, for about seven miles: it is to say, as far down as the head of the actual canal round the Little Falls."

Although the location of this line was improved by subsequent examination, yet, on no canal in America, and on very few, if any, in the world,

will there be found, and certainly on no part of the Chesapeake and Ohio canal, do there remain to be encountered, obstacles more appalling, than have been here overcome: so they were regarded by the distinguished foreign engineer then at the head of the United States' Board of Internal Improvement, whose language has been quoted above.

In the compass of eleven miles, along precipices of granite, bounding a river which bore last Winter, on its bosom, ice and snow, elevated for several miles thirty feet above its ordinary height, a canal was to be constructed, to overcome a rise of 128 feet, being more than eleven feet in each mile. For a part of this way, a practicable pathway could not be formed but at great cost; and many hundred acres of huge and craggy rocks, piled on each other, chilled the enterprise which attempted to subdue them. Earth was to be derived from remote distances to construct embankments, and the embankments to precede the transportation of the stone and other materials required for the construction of six of the sixteen locks. The beds of not a few of these were either to be sunk in the uneven rock, or to be lifted up high above it, and sustained by lateral walls and embankments. It is not wonderful that the United States' engineers, who first traversed, described, and estimated the route for this canal, along the north bank of the Potomac, around the Great Falls, should have estimated its cost at near 80,000 dollars a mile, supposing their canal to be forty-eight feet wide at the surface of the water, and five feet deep, except where "*reduced considerably*," as often as peculiar difficulties, which here occurred at every step of their way, required that breadth to be diminished

But a reproof is given to those persevering misrepresentations, which swell the actual to very near the estimated cost of this work, by the spectacle of a canal, in use, between the same termini on the Potomac, completed at a cost of 20,000 dollars a mile less than that estimate; constructed, too, with a breadth exceeding every where in that distance, forty-eight feet, often more and seldom less than sixty feet, and a depth never short of six feet; having beneath it, numerous culverts, some large enough to serve as viaducts to every species of conveyance; with sixteen cut stone locks, laid in hydraulic lime, seven of which are of hard granite blocks, and nine of free stone, transported from 10 to 60 miles, by water and land; while the canal itself is, for several miles of the eleven, lined along one or both of its inner slopes with a neat stone pavement, supported on the outside by massy walls, in some places sixty feet high, to guard it from abrasion, and has, moreover, included in its cost, more than 22,000 dollars expended on its improvement, exclusive of its repairs, since the opening of its navigation.

Several benefits would accrue to the Chesapeake and Ohio Canal Company from a close analysis of the causes of the actual, compared with the estimated, cost of this enlarged and difficult line of canal. Among them, would be a general conviction, that too much has not been expended in repeated surveys, by eminent practical civil engineers, preparatory to its final location; nor if the number, variety, and quality of its works be regarded, in multiplying, to the necessary extent, the corps of engineers, by whom its actual construction was to be vigilantly and constantly watched.

With all this circumspection, not one of those engineers believes, nor any officer of the company will maintain, nor do the President and Directors pretend, that errors have not been committed in the location, as well as the construction of this work; by the timely correction of which, if perceived, its cost might have been reduced, and its strength, as well as its appearance, improved.

To alter the location is now impracticable, but at a cost wholly incommensurate with its end: but the errors, here adverted to, in the construction of the canal, are in a train of correction, and will be obviated, it is believed, effectually, without any serious inconvenience, or much additional expense.

Those upon the 10th sub-division have already been corrected, at the cost stated in the table; the residue occur chiefly, if not solely, in and immediately above Georgetown, in relation to two locks, and a culvert serving as a viaduct. One of the wings near the footing of each of the former, and the ring stone of the arches of the latter, are here referred to: the latter should have been of granite, and the former more effectually secured, as they will be very speedily.

There can be no question but that the part of the canal already completed exceeds in difficulty, and will be found to have surpassed in cost, that part of the eastern section which remains to be executed; and, consequently, that no authority can be deduced *from experience* against that estimate of the cost of this section, which was presented to the stockholders by the last annual report of the Board of Directors.

Between Harper's Ferry and the basin of Washington and Georgetown, 31 of the 72 lift-locks of this section occur; so that 248 feet of the entire elevation, from the tide to Cumberland, will have been surmounted in the first 60 miles of the 186 which constitute the entire eastern section; making, if this proportion be examined, a difference of more than $3000 per mile, for lockage only, in favor of the part of the canal above the Shenandoah.

In the single material of hydraulic lime, required for every species of masonry exposed to the action of water, and absolutely necessary in the construction of durable locks of stone, not less than the farther saving of $ 500 will be effected on the cost of each lock, by the reduced price of transportation.

Stone, if not more abundant, will be found more conveniently distributed, above the Blue Ridge, than below. Outward protection walls will be often required, and for considerable distances above, as below, but no walls or embankments, exceeding in height one-half of the elevation of those on 12th, 15th, and 18th sections of the work already completed. Much narrower dams across the river, as noticed in the former report, will be necessary to fill the feeders at and above Harper's Ferry. Above all, setting down at nothing the gain of experience, the general health of the valley of the Potomac, and the abundant supply of provisions and accommodation, which that circumstance, as well as the superior fertility of the country, promises to the laborer above the Point of Rocks, will reduce the price of every species of work after passing that point.

If the company shall be permitted, by the courts of Maryland, to conduct their canal along her shore, on the ground so often surveyed for its use, no aqueduct like that of seven arches of fifty-four feet span, across the Monocacy, will occur to swell the masonry to be constructed above that river. All the aqueducts and culverts of the 140 miles above it, will probably not exceed, in cost, those of the 44 miles below the Point of Rocks.

Twenty-five thousand dollars a mile is, therefore, considered an ample estimate of the part of the eastern section, in length 126 miles, above Harper's Ferry. This part of the canal will, therefore, require for its construction $ 3,150,000, which added to the cost of that between Harper's Ferry and Georgetown, will produce very near the former estimate of $5,000,000, leaving, as that estimate did, the works in that town, to be paid for by the

peculiar uses of which they are susceptible, in the manner heretofore proposed.

To provide for the sale of the mole constructed of the surplus earth of the Georgetown excavation, and of such surplus water as may be drawn to the canal, by the dam across the river, at the head of the Little Falls, application was renewed, last Winter, to the Legislature of Maryland, and to the Congress of the United States, for their assent to the recent act of Virginia, granting all that the company had authorized the board to ask, and to the former act of Pennsylvania anticipating and providing for their wants.

The pressure of public affairs, of a general nature, in Congress, and of other matters prior in the order of business, concurred, with the local opposition in the committee to which the bill of the prior session had been recommitted, to delay till the end of the session any final decision upon it.

The views taken of the Virginia act, and of the memorial of the company, by the General Assembly of Maryland, will be seen in an accompanying document, upon which the board forbear to make any comment.

Time, which allows the passions to cool, and gives to knowledge fair scope for action, is the best corrective of popular errors, which are often confirmed, and exasperated by vigorous resistance.

It is not possible that the people of Maryland will long hazard a transfer to the shores of Virginia, of every manufacturing village to which a judicious use of the surplus water of the Potomac might give rise; or that both States will permit a source of common improvement, so fruitful of good, to remain unprofitable to either bank of the Potomac.

As to the sale of the mole in Georgetown, it was originally announced in the first annual report of this board, to be one of the ends of its construction: and far from injuring the interests which started up in opposition to this measure, no application of the mole could be more beneficial than that proposed, either to the community at large, or to its opponents themselves, as can easily be demonstrated.

An attempt has, indeed, been made to represent the sale of the mole, thus early proposed, as some consolation to the stockholders, for its certain and heavy cost, as vitiating altogether the right to construct it, for its avowed and obvious use.

If this board be correct in their views of both these subjects, the only loss which the company can sustain, from the delay of the other parties to their charter, in recognizing the justice and wisdom of the amendments proposed to it by the Pennsylvania and Virginia acts, will be the loss of interest on the dormant capital.

Even this loss admits of the consolation, that the capital itself, though inactive, is daily appreciating, as the value of the canal is developed by the use of its navigation.

The present funds of the company will certainly complete 120 miles of it, or carry it twenty miles above the point, necessary to the preservation of their charter; and these, and other resources for the completion of the entire canal, will not be lost sight of, in the estimate of its ultimate success.

From topics less soothing, the board turn with pleasure to the recent manifestation, by the patriotic commonwealth of Pennsylvania, of her continued interest in the prosperity of an enterprize deeply interesting, not to herself only, but to the whole American Union. The liberality with which the Legislature of Pennsylvania have recommended the appropriation, by Congress, of a million of dollars to the construction of of the western section

of the Chesapeake and Ohio canal, is the more honorable to this commonwealth, since she is, herself seeking to secure, to her great eastern emporium, that commerce, which every effort to connect, by inland navigation, the eastern and western waters of the United States, has a tendency to divide.

Another source of gratification is opened to the stockholders of the Chesapeake and Ohio canal, by this recent vote, as well as by other late proceedings of the Pennsylvania Legislature. It is, that in a commonwealth so distinguished for the number and excellence of its highways, designed for intercourse both by land and water, railroads have not superseded all sense of the superior utility of canals, where water exists in sufficient quantity for their construction, and other circumstances conspire to give to them a decided preference. The unabated zeal with which New York and Ohio are completing their magnificent systems of canals, strongly fortifies this authority.

It must be gratifying to the liberal friends of Internal Improvement every where, and especially to those who would avail themselves of the benefit of uniform transportation, in States already intersected by many navigable rivers, and abounding with streams that can be readily made subservient to the same end, to learn, from the recent experiments on the canals of Scotland, that the established theories which limited the velocity of navigation on canals, are giving place to the lessons of practical knowledge; the sure corrective of false philosophy in all physical science.

The compass of this already extended report refuses admittance, into its text, of all the very interesting intelligence to be derived from the late work of Mr. William Fairbairn, addressed to Thomas Grahame, Esq. of Glasgow, from which the following extracts are made:

They prove, beyond the possibility of doubt, that a velocity of 15 miles an hour has been attained on the Forth and Clyde canal, which, although ten feet deep, is, in width, but three feet broader than the Chesapeake and Ohio canal—that, on the Ardrossan canal, one of the narrowest in Scotland, a velocity of 12 miles per hour has been attained, and that "eight persons and the steersman of a boat accomplished a distance of two miles, with one horse, in ten minutes, without any surge, or agitation of the water, injurious to the banks."

The summary of the results from the first experiments on the Forth and Clyde canal, embraced three objects, worthy of particular notice, as this author very justly affirms: "First, the ease with which boats were brought up, or stopped, when moving at a high rate of velocity; secondly, the little additional labor, in drawing, occasioned to the horse, when drawing the boat at this high rate, as compared with a low rate of velocity; and thirdly, the apparent diminution of the surge, or agitation in the water, at a high rate of velocity."

Since these experiments, "a boat has been regularly plying between Glasgow, Paisley, and Johnston, on the Ardrossan canal," and carrying "from forty to fifty passengers, at the rate of from nine to ten miles an hour."

Other experiments have been made, on the Monkland, the Union, and the Forth and Clyde canals of Scotland, to two of which, made on the last of these canals, as far back as the 7th and 8th of July, 1830, the attention of the stockholders is particularly invited, as they show that the velocity of the passage-boats on the Chesapeake and Ohio canal, will not encounter pecu-

liar or insuperable obstructions from its numerous locks. It has, as yet, but one permanent bridge above Georgetown, in a distance of 48 miles, and that is not only very elevated, but designed to be provided with a suitable draw.

"On Wednesday, the 7th of July, the SWIFT, a boat 60 feet long and 8 feet 6 inches broad, twin-built, and fitted to carry from 50 to 60 passengers, started from Port Dundas, at 16 minutes past nine in the morning, having on board 33 passengers (all men) and their baggage. Proceeding through the Forth, and Clyde, and Union canals, she reached Edinburgh at 29 minutes past four in the afternoon. She thus made a voyage of 56 miles and a half in the space of 7 hours and 14 minutes. In the course of this voyage, she passed through 15 locks, 18 draw-bridges, a tunnel of 750 yards long, and over three long narrow aqueducts, and under 60 common bridges, which carry roads over the Union canal. Her average rate of speed, during the voyage, was nearly eight miles per hour, including every stoppage."

"On the following day, Thursday, the 8th of July, the SWIFT started from Edinburgh, 22 minutes past nine in the morning, and returning by the same route, with 33 passengers (all men) and luggage, she reached Glasgow precisely at 4 o'clock in the afternoon—that is, in 6 hours 38 minutes: going, thus, at the rate of nearly nine miles per hour." "On both days the weather was most unfavorable, from much rain, and a strong gale of wind directly in her face, having been from the east on Wednesday, and from the west on Thursday." "When free from the locks, tunnel, and other impediments, the speed at which she proceeded varied from 6 to 12 miles an hour; and the extraordinary results of the previous experiments made on the Paisley canal, and Forth and Clyde canal, were again completely verified and ascertained during her progress through 113 miles of canal navigation. For it appeared that when she moved through the water at the rate of 6 or 7 miles an hour, there was a great swell or wave constantly in her front, and she was followed by a strong surge or wave, bearing against the bank of the canal. At these times, the hauling rope was tight, and the horses appeared to be distressed. But, as the speed was increased, the wave, or swelling of water in her front, sunk down; and when the speed came to be about nine miles an hour, the swell entirely disappeared; the waters in front became smooth and level; the hauling rope slackened, and the horses seemed easy; and little or no surge was to be seen on the banks behind the vessel."

On these experiments, the following comment is made by the same writer: "There appears, therefore, no reason to fear that the banks of canals can ever be hurt by increasing the speed of boats to the utmost attainable height; and measures are in progress for increasing the speed of passage boats on the Forth and Clyde canal, and the Union canal; or, at least, of keeping it, during the whole voyage between Glasgow and Edinburgh, to the highest rate which has been already realized, and thus reducing the time consumed in the voyage to five hours."

To these experiments, Mr. Fairbairn has added many others, which are referred to in the text, and more minutely described in the appendix of his very interesting work; and from them he deduces results confounding all the established theories "that the resistance to a body drawn along a line of water confined within the banks of a canal, did not appear to increase in the ratio laid down in theory; and that, while at a low rate of velocity, viz: at and under six miles an hour, the resistance to the progress of the boat, on a broad line of water, was considerably less than on a narrower line; on the

contrary, at a high rate of velocity, say above ten miles an hour, the forces necessary to the propulsion of the boat, on a broad and narrow line of water, appeared to be the same, if the advantage was not rather in favor of the narrow line."

From these observations, he was induced "to recommend, and the Forth and Clyde canal company to agree, to build a light twin iron steam passage-boat, to ply between Glasgow and Edinburgh," which, at the date of his publication, he was preparing to launch. "Her length is to be 68 feet, her breadth of beam 11½ feet, her steam-engine to be of ten horse power, the diameter of her paddle-wheel 9 feet," "and its motion calculated to give from 50 to 60 strokes in the minute; her whole weight 7 tons 16 cwt. and her draught of water 16 inches. She will accommodate from 100 to 150 passengers; her anticipated velocity will be from nine to ten miles an hour, and the cost to the canal company, for the conveyance of a passenger between Edinburgh and Glasgow, 56 miles, will not much exceed two pence; which," Mr. Fairbairn adds, "is not a fifteenth of the expense of the conveyance of the same person, at the same rate, supposing it attainable and maintainable by horses."

Mr. Fairbairn says, "that however much I was persuaded that steam power was the cheapest for high velocities, and also for propelling vessels in canals, where the trade was regular, I was not till lately prepared to consider a steam boat, on a canal, as the cheapest for the conveyance of goods, where the trade was irregular, and where the boat had not only to contain a cargo, but, at the same time, to carry her own engine and all the conveniences necessary for the application of machinery."

But he proceeds—"Mr. Grahame has lately put into my hands a letter on this subject, addressed to a shipping company, carrying goods along a line of canal 56 miles in length; the calculations contained in that communication, are given in the appendix, and seem to be decisive in favor of steam power. The company to which this letter is addressed, have to pay for a quantity of horse power sufficient io deliver forty tons of goods, at each extremity of this line of 56 miles, every day in the year; besides a spare power employed chiefly in one particular branch of their trade.

"The sum they pay for each delivery is one guinea, each way, or at a rate of about one-ninth of a penny per ton per mile, for the trackage of the goods conveyed; the company in question supplying the tracking lines, but, with this addition, the charge for trackage is not increased to one-eighth of a penny per ton per mile.

"This," says Mr. Fairbairn, "is certainly a small sum whereon to effect a saving by a change of power; but, nevertheless, it appears (from Mr. Grahame's and my own calculations) that not only such saving may be effected, but an additional saving of a large portion of time can be made, by the change from horse to steam power."

"The calculations there referred to, make it quite unnecessary," adds the writer, "to say any thing on the subject of *steam power* as a substitute for trackage, on canals. If *it* be so much cheaper than horses, in the expensive shape of a moving and carrying power *united in the same boat*, what advantages may not all canals derive from its introduction, in the cheap form of a tug-boat, in place of horses?"

In his appendix, the author adds—"I am the more convinced of the efficacy of steam trackage above all others, from the circumstance that the train of boats intended to be towed, would follow in each others wake; as the

eddy formed by the leading vessel materially lessens the resistance opposed to the succeeding boats." "The small amount of power required to a tow vessel, was remarked by Mr. Grahame, in his account of the voyage of the Cyclops, from Alloa to Port Dundas:" he states, "When we brought her into the canal, we attached her to the passage boat, and she drew her along the canal two miles—one mile in fourteen, and the other in fifteen minutes. We then detached her from the passage boat, and did two other miles, but could not save by this decrease of labor more than a minute, or a minute and a few seconds in each mile. One thing is very evident," says Mr. Fairbairn, "that the introduction of steam instead of animal power, would dispense with the annual repairs and maintenance of the horse paths; the complaints and delays arising from drivers, horses, &c. would be avoided, and many contingent expenses saved by the introduction of this never-failing and very effective agent as a moving power for the towage of boats on canals."

The great importance of the facts and views supplied by the work of Mr. Fairbairn, of which, it is believed, but very few copies have reached the United States, will constitute, it is confidently hoped, a sufficient apology for the copious extracts here made from it. If this work shall serve but to invite the public attention to the erroneous but prevalent opinion, that no further improvement can be made in inland navigation, by canals, because sustained by monopoly, they have been so long stationary, this notice of Mr. Fairbairn's work cannot prove useless, since experience, as he has incontestibly shown, is exploding the doctrines on this subject, hitherto sustained, without exception, from any quarter, by the exclusive advocates of railroads.

But this board does not feel that it would discharge its duty to its immediate constituents, or to the public, who are interested in the completion of the great highway which they have long been constructing, if they did not proceed one or two steps farther in this investigation.

In the course of proceeding to which a committee of the House of Delegates of Maryland resorted, last Winter, letters were cotemporaneously addressed by the chairman of the committee, to the Baltimore and Ohio Railroad, and the Chesapeake and Ohio Canal Companies, inquiring, among other topics, for which the undersigned beg leave to refer to the letter itself, "into the relative expense, benefits, and facilities of constructing railroads and canals, with a view of ascertaining to which of these means the funds of the State can be most beneficially applied." Their own answer to this letter, through the official communication of the President of this board, will be seen in an accompanying printed pamphlet.

That of the Baltimore and Ohio Railroad Company was made, in part, through their chief engineer; and never having been seen by this board, nor the report, of which it made a part, till since the adjournment of the Legislature of Maryland, the present affords the first occasion for referring to some of its very curious contents.

Reserving for a separate notice, the other subjects of the report, and especially those of a personal nature, *seemingly* designed, and certainly calculated, to reflect on the proceedings of this board, they invite the attention of the stockholders of the company, and of the public, to the very singular use, among others, which the chief engineer of the Railroad Company, has made of the joint survey for a railroad and canal, along the difficult passes, four in number, somewhat less than two miles in extent, in a distance of twelve,

between the Point of Rocks and Harper's Ferry, *in order to establish the superior economy of railroads to canals.*

The ingenious writer premises, "that, as a canal and a railroad cannot be constructed between any two points on the same identical route, the evidence of their comparative expense, on a given line, must consequently be that of an estimate for each, or by an approximate conclusion drawn from analogy." "I know," he adds, "of but one route on which careful estimates have been made at the same time, both for a canal and a railroad. The *route* here alluded to, is along the Potomac river, from the Point of Rocks to Harper's Ferry, or at least *so much of that route* as was included in the narrow passes:" as was included, he should have added, in $1\frac{7}{8}$ mile, out of a distance of 12, along which no estimate whatever was made for a railroad of any description. The survey of that engineer having been exclusively directed to those narrow passes, as the only lines of expected interference between the canal and railroad.

But his conclusion far outruns his premises. "From these estimates, therefore, added to the estimates for the railroad an average price for the laying of three tracts of railway, on the graduated surface, so to be prepared, we arrive at results which will give the comparative probable expense of both the canal and railroad. The canal was assumed to be of such dimensions, that, with a depth of water of six feet, its cross section should contain an arena" [supposed to be intended for area] "of 306 square feet. The breadth of the graduation for the railroad was to be 30 feet." Hence, as the canal was to cost, at these narrow passes, "at the rate of $79,036 per mile, and the railroad constructed on wooden sills, but $38,294 per mile, or after adding $1,000 or 1,500 per mile for stone sills, something less than $40,000," the writer concludes, "on the *whole, since the estimates for the canal do not include any lockage, although 40 feet elevation is to be overcome between the Point of Rocks and Harper's Ferry, nor* $5,000 *a mile,*" at which he is pleased to estimate the cost of lining the interior banks of the canal with stone, "*a precaution,*" he says, "*without which the experience of the Erie canal shows that no such work can be considered as finished,*" "that the ratio of the probable expense of a railroad and canal will, on the ground here estimated, be as two for the canal to one for the railroad."

So singular does his own conclusion appear to himself, that, to guard against criticism, he acknowledges in his fourth commentary on these comparative estimates, that "he has not seen the last estimates for the canal, on the *intermediate grounds,* (more than ten miles of the twelve,) and therefore cannot institute *so strict a comparison* with regard to them;" but he makes up for this deficiency of knowledge by a broad assertion, that "*in the most favorable ground along the river bottom lands,* the expense of the canal will exceed that of the railroad from 25 to 50 per cent."

Whether this reasoning proved satisfactory to the individual, the President of the Baltimore and Ohio Railroad Company, to whom it was addressed, and by whom it was transmitted, without comment, to the committee of the House of Delegates of Maryland, does not further appear, any more than does the effect it may have produced on the committee or on the House. But such reasoning is so extraordinary in itself, and so contradictory of known facts, part of which are supplied by the author himself, that it is difficult to reconcile it to his high reputation for candor.

The spaces along which the four short lines of canal and railroad were

expected to come in collision, the longest of which is in length but 3,052 feet, and the shortest 1,126, are four difficult projecting cliffs of rocks, hemming in the current of the Potomac, at the bases of the mountains and ridges, by which it descends from the Blue Ridge through the Kitoctan mountain. The railroad was to be bedded on these rocks for a space of 30 feet only in breadth. The canal, having a cross section of 306 feet, and a depth of 6 only, could not have a breath at the surface of less than 51 feet, and adding 3 feet for the stretch of the inner slope of earth, next the river, 12 for the breadth of its tow-path, and 20 for the horizontal stretch of the outward slope; supposing that the tow-path bank is not higher, above its base, here in the river, which is improbable, and that the angle of the slope is as steep as 45°, which would be inexpedient, we have a space constructed partly on rock and partly in water, of the breadth of 86 feet, compared by this engineer, with one of 30 feet; and the canal, in this space, charged with all the attendant expenses of outside walling, to guard against abrasion from the river, puddling within its banks in order to retain the water admitted into it, and, as the ingenious and liberal calculator provides, $5,000 a mile also, for paving within, although one of its sides must be of rock.

Had the writer inquired for the estimates of the part of this canal along the "intermediate grounds," he would have found that the working estimate, prepared to regulate the acceptance or rejection of proposals for its construction, does not extend the cost of the twelve miles, after including not only its lockage, but the expense of a substantial dam across the river, immediately below Harper's Ferry, beyond $250,000; a sum, less than that, which he admits the railroad will cost, within the same distance. For, putting down the cost of the road provided for, on his own estimate, at $39,794 a mile, and its length, at his measurement, of 11,134 feet, its tracks, as he proposes, to be three in number, and laid on stone sills, as he suggests, though on the principle of perfection, which he applies to canals, he ought to provide at least a fourth track, for the cars to pass each other with various velocities, which would add to this estimate at least $13,233 more, for this track, and the further cost of graduation, and their results, in order to reach Harper's Ferry, for the 3 tracks, at $6,500 each, on a line of 9 miles and 4,706 feet, *for the rails alone*, $192,880, which, added to cost of 11,134 feet, computed by himself at $39,794 a mile, furnishes an aggregate of $276,794, without any allowance whatever for graduating the foundation of the rails for a distance of 9 miles and 4,706 feet, or for a single perch of masonry, for culverts, viaducts, or side drains of any description; an aggregate exceeding the working estimate for the canal along the same line, by the sum of $26,794, and if but a moderate allowance be made for the graduation, including the masonry of the railroad, by a sum not much short of one hundred thousand dollars.

It has been acknowledged that these items, exclusive of the rail tracks on the first 7 miles of this road, leading out of Baltimore, cost $438,775 85, exclusive of all contingencies, being $62,654 80 per mile, and allowing for three tracks with stone sills, making up a sum exceeding $80,000 a mile, exclusive of contingencies. These, even on this part of this road, cannot appear inconsiderable when reference is had to the report of the President and Directors, from which the above facts are obtained, wherein "sixty-one thousand one hundred and seventy-seven dollars twenty-five cents are charged to expenses incurred in surveys and locations, including the pay of engineers and their assistants; six thousand eight hundred and sixty-five

dollars thirty-two cents for law expenses, fees of counsel, and chancery expenses; and sixty-six thousand nine hundred and eighty-eight dollars sixty-two cents for cost of machinery, for the purpose of construction of the railroad, of transportation and weighing, including the purchase of patent rights, and moving power, contingencies, expenses of widening the cuts, and embankments, and *perfecting the graduation* at the time of laying the rails, releases of the right of way, discounts, expenses of opening the books," &c. How much of the $66,988 62 should be charged to the first seven miles of the road is not stated, though a part of it would seem to belong to the graduation, or the "*perfecting of the graduation*, prior to the laying of the rails," it being the part of this road whereon the rails were first laid; nothing is added for the improvements subsequent to opening the road.

It would, it is obvious, be unfair to charge the proposed railway, between Harper's Ferry and the Point of Rocks, with the maximum cost of the graduation, on the most expensive part of the route of this road, but it would be equally correct, with the course actually pursued by the chief engineer of this company, in ascertaining the relative costs of canals and railroads, by referring to the construction of short pieces of canals and railways, under or upon precipices of granite, and in the bottoms or along the rocky margin of rapid rivers.

Much more incorrect, however, is the sweeping general assertion of this engineer, that, "on the most favorable ground," for a canal, "its cost will exceed by 50 or 25 per cent. (the calculator scorns fractions) that of a railway," (of course, such as he has been describing,) of three tracks, or at least of two tracks.

Several miles of the Chesapeake and Ohio canal have been constructed, along the bottoms of the Potomac, for less than the cost of a single railway track; one half mile, on level ground, at little more than $1,800, and the possibility of this is so obvious to any engineer, who will take the trouble to make a calculation of the necessary depth of cutting, to supply the banks of a canal, where you can chose its level, that the assertion of this writer, in face of his own facts, is not a little remarkable.

It is not, however, more so, than what the same engineer attempts to prove in relation to "other routes of canals and railroads," than those of a few thousand feet under the precipices of the Potomac, to which he first gives his candid attention.

The liberality of his course of inquiry towards the Chesapeake and Ohio canal is here again manifested in his statement, "that, so far as the structure of this canal has been prosecuted, it has been understood," he does not say by whom, "that the estimate of its cost, at $5,000,000 between Georgetown and Cumberland, has been found to be wholly inadequate; and *he is of opinion*, that unless the dimensions of the canal be contracted, or the work be made less permanent in character, the estimate first mentioned, that of $8,000,000, will be not far from the amount which that work will have actually cost, should it ever be completed to Cumberland."

It is now well known that no survey, of any description, for a railway up the left bank of the Potomac had been attempted, before the purchase, by the Baltimore and Ohio Railroad Company, with a celerity unexampled, of the ground along the difficult passes, on the left bank of that river, where they admit, themselves, that no choice of way existed; and while it is believed that no working survey has even since been completed of the

entire route of a railway from the Point of Rocks to Cumberland, it is not a little astonishing, that the chief engineer of this company, who has so little reliance on the calculations of experience, entertains the *confident* belief that the railway from Baltimore to Cumberland, will not exceed, in cost, $5,000,000!

He also believes, it appears, that the expense of constructing a canal from Baltimore to the "Point of Rocks, would be *double*, what the railroad, *between the same points*, will cost:" while the reason that he gives for this belief, is, that the estimate reported by Dr. Howard, "for a canal from Georgetown to Baltimore, the length being 44¾ miles, amounted to $2,800,000." Now, this author of the comparative estimate of the cost of railroads and canals, might have as well assumed any other estimated route for a canal as this, for his standard of comparison, since the Baltimore and Ohio railroad, in passing to the Point of Rocks, occupies but a very small part, if any, of that space which Dr. Howard surveyed for a canal from Baltimore to Georgetown; and this engineer very well knew, at the same time, that the estimate of the cost of this canal, was founded on the same erroneous data, which led Dr. Howard, in conjunction with the United States' engineers, to compute a canal with a cross section of 202.5 feet, only, at a price greatly exceeding the actual cost of one of 306 feet along the valley of the Potomac, and over very nearly the same ground. Let the estimate for the Baltimore canal be reduced by a reference to the actual cost of the Chesapeake and Ohio canal, and the estimated cost of that, by recurring, from its actual, to its former estimated dimensions, and a canal from Georgetown to Baltimore, 48 feet wide and 5 deep, would appear capable of construction, by this fair standard, at less than the present estimate of the sixty-seven miles of railroad from Baltimore to the Point of Rocks, or of a substantial railroad from Baltimore to Georgetown.

It is not a little surprising, that in reply to the grave call of a Legislature, this engineer did not recur to the ascertained cost of the archetype and model of all modern railroads, that between Manchester and Liverpool, for one term of his comparative estimate of the cost of railroads and canals. In looking to his other term, it is equally strange that he should have passed, unheedingly, by the numerous canals of the United States. Those, for example, of New York, of Pennsylvania, and of Ohio.

By an early report of her Canal Commissioners, the canals of New York were stated to have cost about seventeen thousand dollars a mile. By the last report of the Canal Commissioners of Ohio, 190 miles of canal in that State, extending from Lake Erie to the north end of the Licking Summit, and now regarded as finished, have been constructed, with all their costly appurtenances, at a price which, embracing every contingent expense, is less than $11,000 a mile; or, by $2,000 short of the cost of the mere rails of a double track, on stone sills, of the Baltimore and Ohio railroad, according to the same engineer.

This comparison omits any allowance for graduation, and contingencies of every description. Yet this practical civil engineer, presumes to tell the Legislature of Maryland, "that in the most favorable grounds along the river bottom lands" of the Potomac, it is presumed, "the expense of the canal, would exceed that of the railroad from 25 to 50 per cent." If the chief engineer of the Baltimore and Ohio railroad could have awaited the late annual report of the Liverpool and Manchester Railroad Company, he would have seen that a railway of only two tracks, overcoming in 32½ miles

an elevation of less than 150 feet, had cost, including all contingencies, £865,000 sterling, a sum exceeding 120,000 dollars per mile; while he must have known, that the magnificent canal of Languedoc, in length 148 miles, with a mean breadth of 49 feet, and overcoming a summit of more than 600 feet, with a lockage of 1200—though constructed with the revenues of the French monarchy, cost much less per mile, than the half of that sum. He would also have perceived that the present charge for transporting a bale of cotton, on the Liverpool and Manchester Railroad, is 10*s.* sterling a ton for a distance of 32½ miles, and 5*s.* sterling for each passenger. Rates which, for commodities, are treble the cost of transportation, for like distances, on the canals of Pennsylvania and New York; and for passengers, more than double the cost of transportation for the greater distance of 56 miles, on the canal between Glasgow and Liverpool.

As to the cost of repairs on canals and railways, which must regulate their nett profits, experience, until matured by time, can furnish no measure of their relative extent. Much must depend upon the excellence of their construction. A celebrated constructor of steam engines and carriages, who has recently returned to America, from England, apprises the public, that there is no railroad in America, of sufficient strength to bear the free use of locomotive engines; and whether the railroad of Liverpool and Manchester will sustain their use, with profit to the company, by which that costly work has been constructed, remains to be verified by the fulfilment of promises not yet realized, and against the suggestions of nine months' experience, on a perfectly new and very smooth road.

Lest the estimate of this board, that the canal between Georgetown and Cumberland will cost 5,000,000 dollars, should appear to be impaired, by passing unnoticed another error of the same engineer, to whose calculations reference has been so often made, it is proper to remark, that if the experiments on the Ardrossan, and other canals of Scotland, have not destroyed all apprehension of injury to the bank of a canal by boats moving on their surface with great velocity, the remedy hitherto applied to prevent such injury, is much less expensive than this engineer supposes, who charges 5,000 dollars a mile for walls calculated to protect the inner slopes of a canal from washing. More than 40,000 superficial yards, one foot in thickness, of such walls, have already been constructed in the Chesapeake and Ohio Canal, at the cost of less than sixteen cents a yard, including the price of transporting the stone some distance by land. The residue of this work, for which the canal excavation furnishes an abundant supply of materials, has been permitted to await the introduction of water into the canal, that the stone may be transported by boats tracked by horses. Allowing twelve cents a cubic yard for the transportation, but reducing the height of the wall as has been found expedient, the cost of such an inner lining for four feet, on each side of the canal immediately below the surface of the water, which is all that is necessary for its object, would be reduced, from a thousand, to about five hundred and eighty-seven dollars per mile.

For several miles together, the Chesapeake and Ohio canal has a border of solid rock on one side, which needs no lining for its protection. In other places, it is spread out to such breadth, by a single embankment on the side next the river, that it needs no such lining along either slope. When compressed, as it is, for less than a single mile on a line of 48, within a breadth under 60 feet, it is always bounded by rock, which yields stone for its inner pavement, free of the cost of transportation, so as to save a part of the above estimated cost.

It is somewhat remarkable that the chief engineer of the Railroad Company should add 5,000 dollars a mile to the cost of the canal at the Point of Rocks for its inner lining of stone, when he takes care to lodge it, as well as the railroad, on a bed of rocks, and provides, in an estimate, of the joint cost of the two works, for a wall of three feet between them.

The residue of his comparison of rail-roads with canals, is equally impartial with the preceding, and obviously designed to withdraw the patronage of the State of Maryland, from her canal, for it is hers unless she chooses to expel it from her territory, to the Baltimore and Ohio railroad. The far greater part of his facts are inconsistent with each other; his assertions are without proof; and his principles have been refuted by experience, as we have seen.

What shall be thought of the judgment which, under the climate of Maryland, and in relation to the Potomac, pronounces that "from the combined effects of floods, breaches, repairs, drought, and cold, the average duration of the navigation of a canal, *in our climate*, is reduced to about one half of the year?"

The Chesapeake and Ohio canal was easily kept open for navigation, and actually navigated with facility, when frozen to the depth of very near three inches. In the late hard winter, its use was not suspended by ice till after the middle of January.

Does any man believe that the Potomac river will not supply an adequate quantity of water, in any drought, to feed a canal along its banks; or that internal intercourse will be promoted, and "transfers and transshipments, adding to the expense and risk of transportation, be prevented," as this writer insinuates, by substituting a railroad for a canal, along the margin of a river which has already upon its stem and its branches above tide-water, a descending navigation, perfect, at some seasons, of 750 miles; or that a country will resort to railroads instead of canals, which has a coast, thus bordering navigable water, for 1,500 miles, counting both shores of this river, and of its often navigable tributaries?

How well does it fit the occasion of his letter, to comprehend among the advantages of railroads, over canals, that the latter occupy the *best lands* of a country, when the very railroad, which this engineer is endeavoring to exalt in value above the Chesapeake and Ohio canal, is seeking to establish a right to pre-occupy the very ground along the Potomac, so often surveyed for the construction of the canal? Let railroads, which are admirable time and labor-saving inventions, be constructed wherever the trade which they are designed to accommodate, will defray the cost of their construction and use, and they can either be rendered more beneficial than canals, or canals cannot be made. The friends of the Chesapeake and Ohio canal never sought to obstruct the progress of the Baltimore and Ohio railroad, till the friends of the latter aimed a mortal blow at the former.

The former sought not to impede, or even delay, as they might readily have done, the grant of the charter of the Railroad Company; not only was the grant perfected without resistance, but the best feelings united the friends of both enterprises, until the route originally contemplated or announced, for the railroad, was changed, and the attempt to seize the ground surveyed for the canal boldly made and justified, on the ground of prior right.

The allegations against the officers of this company, so often repeated, in the late report of the Baltimore and Ohio Railroad Company to the Legis-

lature of Maryland being groundless in every respect, recoil upon their authors, and neither merit nor will receive a reply from this board.

By yielding obedience to the late orders of the chancellor of Maryland, fixing on the 15th of this month for the trial of the case depending between the two companies, the causes of mutual recrimination, between them, will be removed; the true interests of both, as well as of the public, be promoted; and an opportunity afforded to the friends of each, of estimating, by a standard more correct than that of interest, the relative propriety of their conduct.

In this object, this board will cordially unite with the President and Directors of the Baltimore and Ohio Railroad Company.

The President and Directors return from this unpleasant topic to other interests of the company, which require notice in this report.

With a view to the preservation of the canal from washes from the hills above Georgetown, across the road, which now constitutes its berm for a considerable distance, and to guard more effectually from danger the traveller upon it, and his property, the President and Directors, having regard to the joint interest of the stockholders and the public, and in anticipation of the wishes of the company, sought of Congress permission to convert into a turnpike, in order to defray the expense of paving and keeping in repair, so much of that road as extends along the canal from Georgetown, to a point opposite the chain bridge across the Potomac. A bill, to that effect, readily received the sanction of the House of Representatives, but was lost in the Senate, through the delay occasioned by efforts, from without, to amend some of its provisions. It reserved to the company, the right to accept it or not; and, as it did not pass, it may be expedient for the stockholders, at the present general meeting, to determine upon the expediency of renewing the application, for its passage, to the next Congress.

It may not be unworthy the attention of the stockholders, to avail themselves of the same occasion, to enable the public, without injury to the canal, to use the tow path, at the discretion of the company, for travelling, by other horses than those engaged in tracking the canal boats. A better road cannot well be conceived, than a tow-path, as broad as this, furnishes; and a moderate toll, not exceeding that of an ordinary turnpike, would render this indulgence to the public, expedient, by defraying its necessary cost to the company.

In the progress of the use of the canal, a defect in the charter of the company has been disclosed which totally escaped the notice of its framers: it contains no express provision for such by-laws, rules, and regulations for the preservation of the works on the canal, and the police of its navigation, as all similar corporations are authorized to pass, in subordination to the Constitution and laws of the United States, and of the several States in which they exist and are required to act.

There are numerous details relative to the registration of the boats, the mode of propelling them, and the use of the tow-path and locks of the canal, that the general laws of a country could scarcely be expected to reach, but which will be eminently conducive to the security of the works of the canal, and to the peace and comfort of those who navigate it. A power to provide them, if not inferable from the general conservative power of the company, ought somewhere to be lodged, so that its aid may be always within the reach of the company, and promptly exerted under adequate sanctions. The experience of many of the States, and the charters espe-

cially, and bye-laws of the canal companies to the north, afford models for the form, extent, and operation of this power; the expediency of asking for which, is here respectfully suggested to the general meeting.

It is presumed that all the other objects hitherto sought to be obtained, by memorials addressed to the several parties to the charter of the company under the authority of former resolutions of the stockholders, are still, within the scope of the authority conveyed by those resolutions, which, having been once approved, need not, on the present occasion, be renewed.

In furtherance of one of the objects sought by these resolutions, a memorial in behalf of the Alexandria Canal Company, was revived at the last session of Congress, and a favorable report obtained from the Committee on Internal Improvements to the House of Representatives, which was not, however, definitively acted upon.

Pursuant to a former resolution of the stockholders, a call has been made by the President and Directors of that company, on this, for the construction of the northern abutment of the aqueduct, across the Potomac, by which they propose to connect their branches with the main stem of the canal. The execution of this call has awaited the precise location of the site of the abutment, and the undisputed acquisition of the ground on which it may be erected.

A similar intimation has been received from the corporation of Washington, that they are preparing for the extension of the navigation of the canal from the basin of Rock creek to the Tiber. This board has announced its readiness to proceed, in good faith, to the construction of this work, when the plan, by which it is to be accomplished, shall be definitively settled in the judgment, and to the satisfaction, of the city corporation.

These two works will complete the labors of the company within the District of Columbia, and leave the attention of the board and its officers to be directed exclusively to the works above the Seneca dam and feeder, to which the canal is at present, and has been for some time, navigable. As the several works placed under contract have advanced towards their completion, the board have reduced the number of engineers in the service of the company.

The first division of the canal, between Washington and Harper's Ferry, originally placed under the direction of an engineer in chief, and distributed into five residencies, having each a resident engineer, an assistant, a rodman, and a volunteer rodman, has been, for some time, reduced to two residencies; and the services of Benjamin S. Wright, engineer in chief, and of Nathan S. Roberts, engineer of the 2d division of the canal, and retained as a commissioner of the court of chancery of Maryland, have been for some time dispensed with as no longer necessary.

This reduction, though required by a just regard to economy, has been attended with no small regret, on the part of the board, at the retirement of those eminent and valuable engineers, aggravated by the mortifying consideration, that the loss of their services is to be ascribed to the legal impediments which continue to obstruct the progress of the canal above the Kitoctan mountain.

A still further reduction of this body must ensue a failure to obtain a decision of the depending controversy, during the ensuing summer.

To the removal of this obstruction, all the wishes of the board have been for some time directed, with an energy increased by the failure of the compromise which once promised to open to them an avenue above, at least as far as Harper's Ferry.

The repairs of the canal have been placed, together with its improvements, under the care of a special superintendent, who is held responsible for both.

The latter consist of alterations of the structure of the canal, or of such additions to the various works as were originally embraced in the plan of the canal, but could be executed with greater economy, after the opening of its navigation.

They consist of buttresses to support the lofty external walls; of stone transported from the surplus of former excavations, and loosely thrown over these walls to strengthen their foundation; of earth to raise embankments which have settled since the admission of the water; and of inner walls to guard the banks from abrasion by the surge of the canal boats.

The duties of this officer are regarded as permanent, but his compensation will be reduced as their importance lessons.

It will not be proper to close their report without adverting more particularly to the revenue of the company.

The board have not augmented, as yet, the tolls allowed by the charter of the Potomac Company, notwithstanding the heavy sum already expended on the new canal: they charge no toll on empty boats, and have hitherto derived no revenue from the transportation of persons on the canal.

The annexed table, however, presents a favorable view of the receipts of tolls, for the last, compared with those of preceding years; and especially since the opening of the new canal, by which the dangerous shoals immediately below the Seneca dam, and between the Great and Little Falls, are avoided. Another table, supplied by the clerk from materials in his office, will show the various subjects on which these tolls have been charged, and the expense attending their collection.

The tolls which accrued between the 15th of August, 1828, and the 1st of June, 1829, amounted to $12,177 94: from June 1st, 1829, to June 1st, 1830, during which period the use of the canal of the Little Falls was long suspended, to $10,719 66—being about the average of many preceding years: while, from the 1st of June, 1830, to the end of the last fiscal year, they have amounted to $29,151 35; of which $20,178 01 have been received since the 1st of January last, and of this the sum of $17,463 46 from the new canal, since the 21st of March.

The commodities which have descended the canal, as might be expected, prior to its extension beyond the first mountain which impedes, by the shoals at its base, the river navigation, have been few in number. They consist chiefly of iron, flour, bacon, lard, butter, and whiskey.

No *lumber*, nor any cord wood, as yet, appears in the returns of the collector. A single proprietor, however, is preparing, above the Great Falls, 10,000 cords of wood for delivery at his manufactory in Georgetown, and the *former*, which lately met the lumber of the north, above those falls, will shortly mingle with it, in the markets of the District of Columbia.

The board look, however, to the extension of the canal to the coal banks, or the discovery of that mineral on its margin, nearer to tide water, for the fulfilment of those hopes of future indemnity and profit to the stockholders, which they cherish and seek to diffuse with a confidence unabated.

The gross amount of tolls is chargeable with the salaries of the lock-keepers and collectors, and with the necessary repairs of the canal in use. All improvements are properly chargeable to the construction of the canal, and are, in fact, a part of its capital stock.

The nett revenue for the fiscal year just expired, is not stated in the subjoined table, in consequence of the accounts of the collectors not having been definitely closed, and a part of the tolls which accrued within the year being yet uncollected; but its amount, for all practical purposes, may be ascertained, before the adjournment of the general meeting.

In relation to the application to be given to this revenue, some difficulty has arisen from the still unsettled pretensions of certain claimants on the late Potomac Company, who have declined accepting the provision offered for their settlement, by the charter, in a subscription to the stock of the company.

A late adjudication of one of these claims, by the circuit court of the District of Columbia, for the county of Washington, has been pronounced in favor of this company, but an appeal has been taken to the Supreme Court of the United States, where it will be the interest of the company to obtain, as early as possible, such an exposition of the true extent of their responsibilities to the creditors of the late Potomac Company, as will produce a general acquiescence and contentment.

Signed on behalf of the President and Directors.

C. F. MERCER,

President of the Chesapeake and Ohio Canal Company.

JUNE 5, 1831.

NOTE A.—The United States' Board of Internal Improvement, in the report, to which allusion is here made, do not, in fact, prefer the dimensions quoted in the text of this report; but, assuming the breadth of their locks to be 14 feet, and 13½ feet to be that of the boat which should pass through them, they say that "the water line" of the canal "should be 60¾ feet—that is, four times and a half the breadth of the boat." And in a subsequent passage of the same report, they say: "The foregoing considerations show, that, in determining the transverse section of a canal of great length, and with a dividing summit level, the amount of lockage must have a due influence upon the breadth and depth of the water section. And, indeed, taking into view the great distance and considerable lockage belonging to the present case, a cross section, *larger than that recommended*, might have been suggested, had not a regard to economy, and to a competent supply of water, during the dry season, forbidden it."

Between Harper's Ferry and Georgetown, to which, by the order of the board, communicated to the stockholders, in the first annual report, the extension of the canal to a breadth of 60, and depth of 6 feet, was limited, there could be no doubt of a sufficient supply of water, and it remained, "in the judgment of the board, a question to be determined hereafter," as the report stated, "whether the enlargement of the dimensions of the canal, beyond fifty feet, shall be extended above the mouth of the Shenandoah." As far at least as that point, a prudent regard to the competition "which the canal has to encounter, not only for the trade of the west, but of its own tributaries, the valleys of the Potomac, and of its navigable branches, required that the board should avail themselves of all the aid which science could supply, to fix this commerce in its natural channel. The acquisition of at least 60 per cent. to the facility of transportation upon the broader and deeper channel provided for the Chesapeake and Ohio canal, is believed to

be worth more than an advance of 20 per cent. on the cost of its construction."

The enlargement of the canal, below the last feeder, to a cross section of from 416.5, to 426 feet, was designed to supply, for several canals, at, or below, Georgetown, and for manufacturing purposes, a sufficient quantity of water, without accelerating the downward current of the canal, or reducing its depth to the injury of its navigation.

Vide pp. 12, 13, and 14, of the first annual report.

[APPENDIX TO THIRD ANNUAL REPORT.]

ABSTRACT of Receipts and Expenditures on account of the Chesapeake and Ohio Canal Company, to the 31st day of May, 1831.

May 31, 1831—			
To capital stock for amount of instalments paid to date, agreeably to returns received			$1,668,750 40
To unclaimed dividends of the Potomac Company, received from the late treasurer for amount due sundry stockholders			366 30
To tolls account, amount received to date			41,073 78
To Potomac Company, received from the late treasurer		131 87	
To do. received from Jno. Strider, for balance due by him		237 30	
To do. received from Jacob Payne, on account		36 18	
To do. received for old iron sold		13 17	
			418 52
To acquisition of lands received from Thos. C. Wright, for old houses condemned and sold		357 60	
To do. received from C. F. Mercer, esq. for an unexpended balance, (31st May, 1830)		672 31	
			1,029 91
To profit and loss received for interest and gain on State of Maryland stock sold			3,375 95
To interest account received on judgments against delinquent stockholders			11 02
To law expenses received for costs of suit against delinquent stockholders		17 38	
To do. received from C. F. Mercer, esq. for an unexpended balance, (31st May, 1831)		80 00	
			97 38
To construction of the canal, received for materials sold the penitentiary			82 20
To Corporation of Georgetown, received on loan 4th inst			25,000 00
			$1,740,205 46
May 31, 1831—			
By contingent expenses Chesapeake and Ohio Canal Company			$5,494 35
By requisitions paid and charged to—			
Pay of officers	17,982 29		
Construction of the canal	1,539,521 33		
Engineer department	71,273 63		

Western section	4,026 05	
Stationery	1,033 38	
Printing	3,770 46	
Postage	249 40	
Acquisition of lands	78,584 62	
Law expenses	5,089 45	
Potomac Company's account	2,749 81	
Do. unclaimed dividends	5 55	
Interest account	166 95	
		1,724,452 95
By balances to the credit of the Chesapeake and Ohio Canal Canal Company in—		
Office Bank United States, Washington	3,972 47	
Bank of Washington	1,858 16	
Bank of the Metropolis	90 18	
Patriotic Bank	1,009 00	
Bank of Alexandria	85 21	
Bank of Potomac	2,114 73	
Farmers and Mechanics' Bank, account contingent	1,005 65	
Office Bank of Valley, Charlestown	5 48	
Do. Leesburg	149 50	
Hagerstown Bank	97 97	
	$10,388 35	
Deduct Farmers and Mechanics' Bank, overdrawn	130 19	
		10,258 16
		$1,740,205 46

Treasurer's Office, Ches. & Ohio Canal Co.

Georgetown, *3d of June*, 1831.

C. SMITH, *Treasurer.*

ACCOUNT of Tolls which have accrued from the 15th August, 1828, *to 1st June*, 1831.

At the Great Falls—	
From 15th August, 1828, to 1st June, 1829	12,177 94
*From 1st June, 1829, to 1st June, 1830	10,719 66
†From 1st June, 1830, to 1st January, 1831	6,786 37
†From 1st January to 1st June, 1831	2,714 55
	$32,398 52

* The navigation of the canal having been suspended, by the construction of the new works, from July, 1829, to March, 1830; the tolls then accruing on the other portions of the old works were withheld by the boatmen, who claim to be discharged from the payment of those tolls. They are, however, included in the amount above stated.

† The new canal was opened for use in November, 1830.

At Seneca guard lock (new canal)—		
From Nov. 1830, to 1st Jan. 1831 - -	2,186 97	
From 21st March, 1831, when the new canal was re-opened, to 1st June, 1831 - -	17,463 46	
		19,650 43
		52,048 95
Total amount of tolls—		
From 15th August, 1828, to 1st June, 1829	12,177 94	
From 1st June, 1829, to 1st June, 1831	10,719 66	
From 1st June, 1830, to 1st June, 1831	29,151 35	
		52,048 95

EXPENSE of maintaining the canal and works, from 15th August, 1828, to 1st June, 1831, including pay of collectors and lock-keepers.

For repairs of gates, opening the channels, &c. of the old works		
at Great Falls - - - - -	1,536 17	
Little Falls - - - - - -	692 28	
		2,228 45
For pay of collector of tolls and keeper of locks at Great Falls, to 1st January, 1831, at $600 per annum - - - - -	1,425 00	
For his three assistants - - -	1,122 86	
At Little Falls, for pay of lock-keeper to 1st June, 1831 - - - - - -	731 25	
		3,279 11
Incidental expenses—printing way-bills -		20 00
		5,527 56
For pay of keepers of locks on new canal, to 1st April, 1831 - - - - -	1,333 78	
Due for same account, to 1st June—say -	400 00	
		1,533 78
		$7,061 34

There has also been paid for repairs on the *new canal*, to 1st June, $8,077 51.

JOHN P. INGLE,
Clerk Chesapeake and Ohio Canal Company.

TRADE of the Potomac River above tide water, from 15th August, 1828, to 1st June, 1831.

DESCENDING CARGOES.	From Aug. 15. 1828 to June 1, 1829	From 1st June 1829 to 1st June 1830.	From 1st June, 1830, to 1st January, 1831.		From 1st Jan. 1831, to 1st June, 1831.		Total from 1st June, 1830, to 1st June, 1831		
	Great Falls	Great Falls	Great Falls	Seneca G'rd Lock.	Great Falls	Seneca G'rd Lock.	Great Falls.	Seneca G'rd Lock.	Both places.
Tobacco - - hogsheads -	49	37	17	-	-	8	17	8	25
Flour - - barrels -	64,560½	65,469½	40,684	11,859	15,095	103,920	55,779	115,779	171,558
Whiskey - - do -	3,907	2,486	469	436	21	1,022	490	1,458	1,948
Apples - - do -	13	8							
Wheat - - bushels -	8,331	8,562	2,155	-	65	9,361	2,220	9,361	11,581
Bran and shorts, &c. - do -	3,942	3,080	1,120	148	-	2,700	1,120	2,848	3,968
Rye and chop - - do -	733	554	26	-	-	-	26	-	26
Corn - - do -	1,032	-	75	-	-	331	75	331	75
Corn meal - - do -	109								
Flax and other seeds - do -	6	51	20	-	22	-	42	-	42
Coal - - do -	2,020	280							
Potatoes - - do -	-	710							
Beans - - do -	-	-	-	-	84	-	84	-	84
Stone - - tons -	130								
Iron, pig, bar, & castings do -	459	211¼	½	5½	-	179	½	184½	185
Bacon - - pounds -	44,650	96,700	968	-	63,400	84,710	64,368	84,710	149,078
Lard and butter - do -	11,400	3,700	-	921	7,500	-	7,500	921	8,421
Hemp and flax - do -	2,850	7,450	9,000	-	-	4,000	9,000	4,000	13,000
Leather - - do -	2,500	1,500	2,300	-	-	-	2,300	-	2,300
Hogs - - do -	-	800	5,100	140	-	-	5,100	140	5,240
Muskets - - boxes -	-	228							
ASCENDING CARGOES.									
Consisting generally of plaster, fish, and salt. Amount of tolls -	$58 65	52 77	-	-	-	313 50	-	313 50	313 50

NOTE.—Returns have not yet been received shewing the particular articles constituting the ascending cargoes. The amount of tolls received is the re- e given. The produce entered under the head of "Great Falls," is that which pass d through the old works of the late Potomac Company, and ha t under the he ad of "Seneca Guard Lock," entered the new canal at that lock, and did not pass through the old works at the Great Falls.

OFFICE OF THE CHESAPEAKE AND OHIO CANAL COMPANY, *Washington, June* 6, 1831. JOHN P. INGLE, *Clerk Ches. & Ohio Canal Co.*

OFFICE OF THE CHESAPEAKE AND OHIO CANAL COMPANY,

Washington, November 6, 1830.

By order of the President and Directors of the Chesapeake and Ohio Canal Company of this date, letters were addressed to Nathan S. Roberts, Esq. engineer of division, and Alfred Cruger, Esq. resident engineer, requesting information as to the time and expense necessary to complete the surveys, locations, drawings, &c. of the line of the canal and railroad between the "Point of Rocks" and Cumberland, according to the order of the Chancellor of Maryland, and after the same manner as that begun by Messrs. Knight and Roberts under that order; also, as to the increased cost, to both companies, of a conjoint construction of the two works, between the before mentioned points; and also, such information as would demonstrate the various disadvantages to which the canal would be exposed by a conjoint construction with a rail-road.

The following answers have been received:

ENGINEERS' OFFICE, *Georgetown, 2d Dec.* 1830.

JOHN P. INGLE, Esq.

Clerk of the Board of Directors of the Ches. & Ohio Canal Company.

SIR: Your letter is received, containing a request from the Board of President and Directors, to inform them what length of time will be necessary to complete the surveys, locations, drawings, &c. of the line of the canal and railroad between the Point of Rocks and Cumberland, according to the order of the Chancellor of Maryland, and after the same manner as that begun by myself and Mr. Knight under that order; and what would be the expense thereof to this company; and, also, what would be the additional expense to both companies of constructing the canal and railroad on such conjoint location? In answer to the above request, I take the liberty to present the following statements:

That the distance from the Point of Rocks to Harper's Ferry, as reported upon by Mr. Knight and myself, under the order of the Chancellor of Maryland, is 12 miles, (and a fraction over,) and the parts in collision amount to 11,153 feet, or 2 1-10 miles, equal to about one sixth of the whole distance.

The time spent by the party was from the 17th of March, to the 4th of July, in making the above locations, calculations, and drawings, or about 3½ months; although I am of opinion, that, with the same party, the same amount of work might be done in a month less time, as considerable time was taken up in making reconnoisances and plans of procedure, and, also, in making up the party of Mr. Knight, who was accidentally destitute of a principal assistant for about two weeks, at the commencement, owing to a circumstance, over which, as I have reason believe, he had no agency or control.

The distance from Harper's Ferry to Cumberland, as taken from the report of Judge Geddes and myself, is stated at 127 miles, and the amount of all the narrow passes, where the canal and railroad will probably come in collision, is about 45 miles, equal to one third part of the whole distance, (and a fraction over.) And, as this amount of narrows is double the proportion to that which has already been reported upon, (below Harper's Ferry,) it would, therefore, require double the time per mile to make the locations, calculations, drawings, &c.

The time employed on 12 miles below Harper's Ferry, as above stated, was 3½ months, or about one month to three and a half miles. And above

Harper's Ferry, by the same progress in operations, an equal distance would require double the time; that is, a distance of three and a half miles would require two months, and, at that rate, the whole distance of 127 miles would require 127 3-5+2=72 months, (and a fraction,) or six years, supposing the labor to be done by one company.

The cost incurred by this company in making the locations, the calculations, levellings, and drawings of cross sections; for every distance of 100 feet or shorter portion as was judged necessary, in accordance with our instructions, wherever the canal and railroad were in collision along the narrows, and in locating the intermediate parts of the canal with the appropriate drawings, which was also deemed necessary to be done, in order to continue the levels, although independent of the railroad, is estimated at a sum not less than $2,600, or $220 per mile; and if the locations, calculations, and drawings, of cross sections are to be taken, on all parts in collision, with the same care as above stated, and including the locations of those parts of the canal that are independent, as was judged necessary, in compliance with the Chancellor's order, the cost would amount to $440 per mile, or $55,880 for the expense of the whole location from Harper's Ferry to Cumberland.

The extra cost of conjoint construction to both companies on the 12 miles reported upon, below Harper's Ferry, is estimated at $1,000 per mile (omitting fractions) and by observing the proportions above stated, the extra expense above Harper's Ferry will be $2,000 per mile, and for the whole distance would be $254,000 for both companies; and provided an equal division is made, the extra cost of a conjoint and simultaneous construction of the canal and railroad from Harper's Ferry to Cumberland, would be $127,000 to each company.

Condensed Summary.

The time spent on 12 miles, between the Point of Rocks and Harpers Ferry, was - - - - - -	3½ months,
The time required on 127 miles, between Harper's Ferry and Cumberland, is - - - - - - -	72 months,
The total estimate of time required, is - - -	75½ months.
Extra expense to the Chesapeake and Ohio Canal Company, viz: Expense of locations on 12 miles below Harper's Ferry -	$2,600
Do. do 127 miles above Harper's Ferry -	55,800
Total amount of estimates for locations, &c. - -	$58,480
One half of the extra expense on 12 miles below Harper's Ferry - - - - - - - -	6,000
One half of the extra expense on 127 miles above Harper's Ferry - - - - - - - -	127,000
Making the estimated extra expense to be incurred by the Chesapeake and Ohio Canal Company, on account of its collisions with the Baltimore and Ohio railroad, by conjoint locations and conjoint construction from the Point of Rocks to Cumberland, in case of compliance with the order of the Chancellor, amount to - -	$191,480

I would observe, that the expense of locating the 12 miles below Harper's Ferry, as abeve stated, is rather larger than that reported to the Chancellor;

and that it is very difficult to state the time occupied, or the exact cost of making that survey, &c. from the Point of Rocks to Harper's Ferry, as much time was spent previous to, and has been since the date of said report, relating to those locations which has not been brought into the above amount; leaving the same still considerable less on that amount than the actual cost to this company.

All which is very respectfully submitted.

NATHAN S. ROBERTS, *Civil Engineer,*
In the service of the Ches. and Ohio Canal Company.

LINE OF THE CHESAPEAKE AND OHIO CANAL,
January 22d, 1831.

CHARLES F. MERCER, Esq.
President of the Chesapeake and Ohio Canal Company:

SIR: The following several interrogatories, transmitted to me by the Clerk, in conformity with an order from the Board of Directors, relating to the effects to be produced upon the Chesapeake and Ohio Canal by the construction of a railroad in union with it, in the valley of the Potomac, from the Point of Rocks to Cumberland, as follows: 1st. The time necessary to complete the surveys, locations, and drawings? 2d. The expense attending such surveys, &c.? 3d. The increased cost of constructing the canal in conjunction with said railroad over and above the cost of an independent canal? 4th. The disadvantages to the canal arising out of this conjoint construction, in reference to its use and future repairs, and such other information as may illustrate the difficulty of constructing conjointly these two works on the left bank of the Potomac? I will answer in the order presented, to the extent of my information.

1st. If the time occupied in making the late survey, from the Point of Rocks to Harper's Ferry, according to the order of the Chancellor of Maryland, may be taken as a criterion, and upon a knowledge of the fact that the difficult passes are more numerous and extensive (in the proportion to distance) between Harper's Ferry and Cumberland, than they are between the termini of the survey referred to, then, the time required in executing the necessary surveys, locations, and drawings, cannot be less than four or five years, which is less than a strict proportion between the part already surveyed and that which remains to be: for I consider that much time was *unavoidably* lost in the first survey by the commissioners, in not commencing operations simultaneously, and in settling the preliminaries and mode of procedure.

2d. By taking the survey heretofore referred to as a standard whereby to estimate the cost of the surveys, &c. the cost cannot be less than $45,000

3d. In answering this interrogatory, I will premise by observing that as far up the Potomac as the Conococheaque, I have minutely examined its left bank; above that river to Cumberland, I have seen the Potomac only at two places, but from a knowledge of the general character of its valley, acquired from two years' residence upon it, and from a familiar acquaintance with its left bank for one hundred miles above the District of Columbia; also from information gathered from the many reports of engineers on the subject, I am in possession of facts that will enable me to answer with an approximation

to accuracy, the interrogatories which has produced those preliminary remarks. From the above sources, I have satisfied myself that the increased cost of construction will be at least $150,000.

4th. Serious disadvantages arise in constructing the canal in connexion with the railroad, from the necessity of placing the canal further into the river at the difficult passes, rendering the foundations less secure, exposing it in a greater degree to the action of the river upon its embankments, to greater hazard to its protection-walls from running ice in drifts, increasing the liability to breaches, both from the canal and river, rendering the necessity of repairs more frequent, and those repairs of greater magnitude. In addition to this, the difficulty and cost of procuring materials for these repairs, is very much increased.

The commnnication between the canal and the interior of the country, in some places will be entirely cut off, and the canal at such places will be inaccessible, at many places it will be much incommoded, and interrupted at nearly all others. The inconvenience and expense of erecting warehouses and forming basins, and other appendages to the canal, will be much increased by the proximity of the railroad.

All these circumstances combine to deprive the canal of the benefits it would otherwise enjoy from a free and uninterrupted intercourse with the country, and they have a direct tendency to injure its commerce.

Respectfully submitted,

ALFRED CRUGER,

Civil Engineer, Ches. and Ohio Canal.

CHESAPEAKE AND OHIO CANAL.

FIRST AND SECOND RESIDENCY.

Abstract of Work executed up to the first of June, 1831,
and estimated as yet to be executed.

CHESAPEAKE AND OHIO CANAL—(the late 1st, 2d, and part of the 3d, now comprehended in and forming the) First Residency. ABSTRACT of Work executed up to the 1st June, 1831, and estimated as yet to be executed.

SECTION.	CONTRACTORS.	GRUBBING.		EXCAVATION OF THE CANAL.							
				COMMON EARTH.				HARD PAN.			
		Work done.	Work to be done.	Work done.		Work to be done.		Work done.		Work to be done.	
		Dolls.	Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.
A	O. H. Dibble & Co.	-	-	66,256	6,625	3,570	357	40,730	13,441	2,980	983
B	John W. Baker	-	-	33,275	2,959	1,850	148	70,390	14,078	6,720	1,344
C	Jesse Leach & Co.	220	-	32,127	3,005	-	-	11,982	2,396	-	-
D	Do.	105	-	29,785	2,855	580	58	18,222	3,644	476	95
E	Do.	40	-	9,819	883	-	-	5,216	1,102	-	-
F	Do.	90	-	16,445	1,415	-	-	6,853	1,268	-	-
G	Hewes, Lewis, & Hughes	175	-	9,390	1,174	-	-	180	54	-	-
H	Do.	455	-	15,294	2,055	-	-	8,205	2,491	-	-
No. 1	Lloyd Pumphrey	125	-	15,062	1,883	-	-	3,716	1,263	-	-
2	Bussard & Pumphrey	100	-	14,296	1,051	-	-	10,140	2,518	-	-
3	Do	175	-	9,955	796	-	-	1,920	380	-	-
4	J. W. Baker & S. Goodrich	75	-	18,134	1,394	-	-	6,276	1,539	-	-
5	Thomas Robison	130	-	5,878	530	-	-	1,365	273	-	-
6	Wathen & Underwood	300	-	15,571	1,090	-	-	8,365	1,338	-	-
7	Clark, Clements, & Co.	177	-	11,646	916	-	-	4,050	994	-	-
8	W. W. Fenlon & Co.	100	-	14,392	1,151	-	-	4,404	1,101	-	-
9	Bussard & Mowry	100	-	7,221	617	-	-	3,283	794	-	-
10	Wade & Childs	125	-	15,605	1,508	-	-	2,834	708	-	-

11	D. Bussard & Z. Gatton -	50	-	11,288	893	-	-	1,768	408	-	-
12	George Ketchum - -	150	-	11,231	1,123	-	-	8,118	1,624	-	-
13	Tripp, Foltz, & alii - -	250	-	14,512	1,486	-	-	10,284	2,438	-	-
14	A. P. Osborne & Co. - -	290	-	7,083	736	-	-	1,561	377	-	-
15	Adams, Ketchum, & alii -	225	-	12,185	1,609	-	-	3,587	817	-	-
16	Luke Hitchcock - -	480	-	1,230	176	-	-	-	-	-	-
17	Henry Smith - - -	300	-	2,598	364	-	-	1,743	523	-	-
18	Renner and others - -	120	-	4,703	635	-	-	4,136	942	-	-
19	Bradley and others - -	100	-	13,428	1,622	-	-	2,677	435	-	-
20	James C. Lackland - -	150	-	6,126	661	-	-	8,495	1,699	-	-
21	Hill & Closs - - -	30	-	15,600	2,047	-	-	5,253	1,051	-	-
22	Do. - - -	375	-	26,470	3,495	-	-	10,162	2,540	-	-
23	Thomas M. Maccubbin - -	200	-	17,909	1,791	-	-	7,452	1,863	-	-
24	William Scott - - -	200	-	21,458	2,146	-	-	2,733	683	-	-
25	A. T. Winsor & Lansdale & Bell -	120	-	28,020	2,151	-	-	-	-	-	-
26	Callan & Clements - -	200	-	17,400	1,392	-	-	3,396	637	-	-
27	James O'Reilly - - -	187	-	17,673	1,944	-	-	7,347	2,204	-	-
28	Washburn & Co. & E. Gumaer -	360	-	28,709	3,858	-	-	2,000	500	-	-
29	Reuben Brackett - -	227	-	24,824	2 631	-	-	3,227	671	-	-
30	H. W. Campbell - -	50	-	24,371	2,667	-	-	-	-	-	-
31	Do. - - -	462	-	27,603	4,140	-	-	641	160	-	-
32	Wines, Crossett & Co. & Gumaer	290	-	8,257	1,121	-	-	93	32	-	-
33	Wines, Campbell, & Crossett -	140	-	27,313	3,274	-	-	6,287	2,440	-	-
34	Campbell, Crosseti, Gumaer & Childs	50	-	33,246	3,728	-	-	2,238	1,007	-	-
35	Knapp & Co. Avery & Co. Childs	250	-	13,084	1,234	2,960	296	-	-	-	-
36	Knapp & Co. Avery & Co. -	300	-	7,315	777	-	-	-	-	-	-
37	Knapp & Co. Williams & Co. -	350	-	6,872	848	810	101	211	60	140	39
38	Knapp & Co. Williams & Co. -	80	-	2,199	268	-	-	-	-	-	-
39	Crown & Offutt - -	225	-	10,728	1,238	-	-	-	-	-	-
40	Thomas Crown - -	19	-	25,956	1,947	-	-	-	-	-	-
		8,722	-	809,542	83,929	9,770	960	301,540	72,493	10,316	2,461

FIRST RESIDENCY. ABSTRACT OF WORK—Continued.

SECTION.	EXCAVATION—Continued.								EMBANKMENT.				SECTION.
	QUARRYING.				BLASTING.				OF EARTH FROM CANAL EXCAVATION.				
	Work done.		Work to be done.		Work done.		Work to be done		Work done.		Work to be done.		
	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds	Cost. Dolls.	Quantity Cubic yds.	Cost Dolls.	Quantity Cubic yds.	Cost. Dolls	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls	
A	-	-	-	-	9,978	8 694	2,150	1,612	106,986	16,002	6,550	917	A
B	23,600	8,260	-	-	51,895	28,381	1,530	1,216	90 155	6,554	8,570	514	B
C	6,497	1,625	-	-	16,914	10,149	-	-	1,691	85	-	-	C
D	1,684	589	160	56	2 531	1,392	214	118	8,252	482	-	-	D
E	790	253	-	-	1,631	1,308	-	-	7,868	948	-	-	E
F	1,175	300	-	-	445	270	-	-	3,662	146	-	-	F
G	1,390	347	-	-	275	206	-	-	-	-	-	-	G
H	3,684	1,352	-	-	6,327	6,327	-	-	1,863	233	-	-	H
No.1	271	117	-	-	2 773	2,426	-	-	232	28	-	-	No.1
2	1,723	480	-	-	5,798	4,044	-	-	8,686	847	-	-	2
3	2,837	567	-	-	4,263	2,720	-	-	6 104	633	-	-	3
4	1,402	561	-	-	1,826	1,249	-	-	4,668	560	-	-	4
5	155	47	-	-	185	92	-	-	13,603	1,394	-	-	5
6	1,456	364	-	-	5,700	2,850	-	-	5,659	685	-	-	6
7	1,543	457	-	-	7,803	4,214	-	-	2,684	196	-	-	7
8	401	76	-	-	7,356	6,620	-	-	8,345	918	-	-	8
9	281	70	-	-	4,999	4,750	-	-	3,245	162	-	-	9
10	412	144	-	-	4,626	2,776	-	-	4,683	443	-	-	10
11	247	86	-	-	1,340	838	-	-	11,539	1,234	-	-	11

12	562	112	-	-	22,947	15,390	-	-	758	151	-	-	12
13	1,084	247	-	-	27,973	28,346	-	-	13,878	2,220	-	-	13
14	170	15	-	-	7,978	7,126	-	-	4,116	506	-	-	14
15	818	286	-	-	21,830	17,625	-	-	8,280	1,430	-	-	15
16	-	-	-	-	9,378	7,034	-	-	-	-	-	-	16
17	396	139		-	7,791	7,012	-	-	-	-	-	-	17
18	362	105	-	-	14,698	10,425	-	-	-	-	-	-	18
19	504	128	-	-	2,301	2,099	-	-	-	-	-	-	19
20	5,634	1,409	-	-	983	983	-	-	-	-	-	-	20
21	172	52	-	-	153	115	-	-	516	67	-	-	21
22	484	194	-	-	11,111	11,111	-	-	11,071	2,768	-	-	22
23	1,240	496	-	-	2,900	1,450	-	-	5,653	848	-	-	23
24	563	248	-	-	842	631	-	-	2,458	246	-	-	24
25	-	-	-	-	64	44	-	-	4,961	572	-	-	25
26	732	183	-	-	13,404	8,565	-	-	3,500	273	-	-	26
27	255	95	-	-	10,463	5,867	-	-	2,939	321	-	-	27
28	407	122	-	-	7,292	5,136	-	-	9,487	2,557	-	-	28
29	255	125	-	-	5,517	4,166	-	-	5,207	625	-	-	29
30	67	29	-	-	93	70	-	-	12,616	1,339	-	-	30
31	-	-	-	-	270	172	-	-	737	78	-	-	31
32	200	92	-	-	11,055	7,465	-	-	9,686	2,457	-	-	32
33	17	8	-	-	7,260	10,277	-	-	-	-	-	-	33
34	-	-	-	-	7,552	10,163	-	-	1,798	90	-	-	34
35	-	-	-	-	63	16	-	-	-	-	-	-	35
36	2,097	608	-	-	521	381	-	-	-	-	-	-	36
37	1,911	573	115	34	10,186	7,640	511	383	-	-	-	-	37
38	-	-	-	-	-	-	-	-	-	-	-	-	38
39	-	-	-	-	-	-	-	-	1,995	250	-	-	39
40	-	-	-	-	-	-	-	-	-	-	-	-	40
	67,480	20,961	275	90	340,790	258,615	4,405	3,329	389,579	48,348	15,120	1,431	

FIRST RESIDENCY: ABSTRACT OF WORK—Continued.

SECTION.	EMBANKMENT—Continued. OF EARTH NOT FROM CANAL EXCAVATION. Work done. Quantity. Cubic yds.	Cost. Dolls.	Work to be done. Quantity. Cubic yds.	Cost. Dolls.	PUDDLING. Work done. Quantity. Cubic yds.	Cost. Dolls.	Work to be done. Quantity. Cubic yds.	Cost. Dolls.	WALLING. OF STONE FROM CANAL EXCAVATION. Work done. Quantity. Perches.	Cost. Dolls.	Work to be done. Quantity. Perches.	Cost. Dolls.	SECTION.
A	-	-	-	-	1,850	370	-	-	4,553	4,346	3,150	2,300	A
B	41,124	7,989	4,575	915	21,804	6,541	4,560	1,368	19,632	13,973	1,918	959	B
C	9,743	1,853	-	-	5,691	1,607	-	-	3,767	1,846	-	-	C
D	-	-	-	-	5,795	1,159	-	-	3,401	1,167	-	-	D
E	2,656	344	-	-	4,630	1,389	-	-	1,173	493	-	-	E
F	33,273	4,405	-	-	2,297	459	-	-	2,648	824	-	-	F
G	25,034	6,258	-	-	580	174	-	-	217	150	-	-	G
H	20,436	4,964	-	-	3,362	1,009	-	-	2,860	1,657	-	-	H
No.1	10,040	1,483	-	-	80	16	-	-	2,327	1,187	-	-	No.1
2	4,291	1,072	-	-	1,146	280	-	-	4,429	2,996	-	-	2
3	27,095	6,774	-	-	840	188	-	-	6,513	3,851	-	-	3
4	2,248	562	-	-	575	144	-	-	3,392	1,851	-	-	4
5	13,647	2,626	-	-	1,985	496	-	-	-	-	-	-	5
6	4,448	695	-	-	2,117	529	-	-	6,310	4,335	-	-	6
7	7,211	1,086	-	-	1,256	323	-	-	5,388	2,583	-	-	7
8	15,200	2,943	-	-	1,240	248	-	-	1,115	530	-	-	8
9	10,050	1,315	-	-	-	-	-	-	511	269	-	-	9
10	6,095	919	-	-	300	75	-	-	751	452	-	-	10
11	29,873	5,066	-	-	267	67	-	-	-	-	-	-	11

12	4,884	755	-	-	1,381	207	-	-	9,593	2,694	-	-	12
13	17,220	4,037	-	-	3,041	675	-	-	7,561	2,818	-	-	13
14	13,502	2,195	-	-	658	162	-	-	883	513	-	-	14
15	91,041	18,121	-	-	3,980	996	-	-	14,246	7,558	-	-	15
16	13,524	3,366	-	-	370	45	-	-	9,275	4,638	-	-	16
17	3,993	963	-	-	-	-	-	-	3,969	2,977	-	-	17
18	45,025	10,743	-	-	3,325	971	-	-	10,774	6,333	-	-	18
19	2,490	374	-	-	442	110	-	-	1,200	524	-	-	19
20	2,791	419	-	-	179	40	-	-	1,225	483	-	-	20
21	-	-	-	-	230	57	-	-	-	-	-	-	21
22	-	-	-	-	215	54	-	-	6,492	4,645	-	-	22
23	6,813	1,072	-	-	606	121	-	-	3,992	1,946	-	-	23
24	-	-	-	-	218	44	-	-	1,492	1,045	-	-	24
25	-	-	-	-	-	-	-	-	-	-	-	-	25
26	21,365	7,400	-	-	-	-	-	-	7,932	3,808	-	-	26
27	14,459	2,398	-	-	1,383	374	-	-	7,213	2,930	-	-	27
28	8,845	2,291	-	-	40	10	-	-	6,237	2,842	-	-	28
29	-	-	-	-	191	48	-	-	2,752	1,741	-	-	29
30	-	-	-	-	561	140	-	-	-	-	-	-	30
31	-	-	-	-	288	57	-	-	-	-	-	-	31
32	36,545	12,223	-	-	900	218	-	-	9,615	4,495	-	-	32
33	-	-	-	-	410	102	-	-	67	25	-	-	33
34	-	-	-	-	48	15	-	-	-	-	-	-	34
35	13,075	1,450	7,500	1,500	-	-	-	-	-	-	-	-	35
36	35,294	7,099	440	110	1,192	447	768	288	1,399	733	63	32	36
37	14,932	3,068	13,930	2,786	242	48	-	-	2,965	1,477	-	-	37
38	41,850	6,278	5,400	810	-	-	-	-	-	-	-	-	38
39	21,505	4,970	-	-	56	20	2,420	484	-	-	-	-	39
40	11,930	1,193	-		-	-	-	-	-	-	-	-	40
	684,547	140,760	31,845	6,121	75,771	20,035	7,748	2,140	177,874	96,735	5,131	3,291	

FIRST RESIDENCY. ABSTRACT OF WORK—Continued.

SECTION.	WALLING—Continued. OF STONE NOT FROM CANAL EXCAVATION. Work done. Quantity. Perches.	Work done. Cost. Dollars.	Work to be done. Quantity. Perches.	Work to be done. Cost. Dollars.	EXTRA WORK. Done.	EXTRA WORK. To be done.	TOTAL OF WORK DONE.	TOTAL OF WORK TO BE DONE.	AGGREGATE.	SECTION.
					Dollars.					
A	-	-	-	-	1,588	-	51,066	6,169	57,235	A
B	-	-	-	-	370	3,175	89,105	9,639	98,744	B
C	-	-	-	-	238	-	23,024	-	23,024	C
D	-	-	-	-	116	-	11,509	327	11,836	D
E	-	-	-	-	143	-	6,903	-	6,903	E
F	-	-	-	-	2,365	-	11,542	-	11,542	F
G	1,145	664	-	-	6,889	-	16,091	-	16,091	G
H	87	43	-	-	6,446	-	27,032	-	27,032	H
No 1	-	-	-	-	94	-	8,622	-	8,622	No.1
2	-	-	-	-	-	-	13,388	-	13,388	2
3	-	-	-	-	-	-	16,084	-	16,084	3
4	170	191	-	-	30	-	8,156	-	8,156	4
5	403	297	-	-	384	-	6,269	-	6,269	5
6	-	-	-	-	-	-	12,186	-	12,186	6
7	-	-	-	-	-	-	10 946	-	10,946	7
8	-	-	-	-	-	-	13,687	-	13,687	8
9	-	-	-	-	-	-	8,077	-	8,077	9
10	-	-	-	-	158	-	7,308	-	7,308	10
11	-	-	-	-	6	-	8,648	-	8,648	11
12	-	-	-	-	86	-	22,292	-	22,292	12
13	-	-	-	-	529	-	43,046	-	43,046	13
14	-	-	-	-	-	-	11,920	-	11,920	14
15	594	570	-	-	1,243	-	50,480	-	50,480	15
16	252	315	-	-	600	-	16,654	-	16,654	16
17	-	-	-	-	155	-	12,433	-	12,433	17

18	803	602	-	-	23	-	30,919	-	30,919	18
19	-	-	-	-	34	-	5,426	-	5,426	19
20	-	-	-	-	425	-	6,269	-	6,269	20
21	-	-	-	-	241	-	3,660	-	3,660	21
22	-	-	-	-	163	-	25,345	-	25,345	22
23	598	598	-	-	430	-	10,815	-	10,815	23
24	1,224	1,469	-	-	-	-	6,712	-	6,712	24
25	51	76	-	-	1,343	-	4,306	-	4,306	25
26	-	-	-	-	-	-	22,458	-	22,458	26
27	-	-	-	-	31	-	16,351	-	16,351	27
28	-	-	-	-	50	-	17,726	-	17,726	28
29	-	-	-	-	-	-	10,234	-	10,234	29
30	-	-	-	-	30	-	4,325	-	4,325	30
31	-	-	-	-	43	-	5,112	-	5,112	31
32	-	-	-	-	250	-	28,643	-	28,643	32
33	-	-	-	-	-	-	16,266	-	16,266	33
34	-	-	-	-	-	-	15,053	-	15,053	34
35	-	-	-	-	-	-	2,950	1,796	4,746	35
36	1,166	875	-	-	297	-	11,517	430	11,947	36
37	624	624	-	-	250	-	14,938	3,343	18,281	37
38	-	-	-	-	-	-	6,626	810	7,436	38
39	-	-	-	-	-	-	6,703	484	7,187	39
40	-	-	-	-	94	200	3,253	200	3,453	40
	7,117	6,324	-	-	25,144	3,375	782,075	23,198	805,273	
INCIDENTAL WORK.....	Pier, basin, and tide-lock - - - - -						74,231	4,712	78,943	
	Locks - - - - - - -						227,055	5,587	232,642	
	Lock-houses - - - - - -						13,615	2,700	16,315	
	Bridges, and work done at market-house in Georgetown -						29,715	3,210	32,925	
	Aqueducts - - - - - -						14,212	9,232	23,444	
	Culverts - - - - - -						50,418	1,454	51,872	
	Waste weirs - - - - - -						8,619	-	8,619	
	Dams - - - - - - -						29,616	9,875	39,491	
	Guard-lock and feeders - - - - -						15,208	196	15,404	
	Improvements - - - - - -						22,902	-	22,902	
							1,267,666	60,164	1,327,830	

CHESAPEAKE AND OHIO CANAL—(part of the late 3d, the 4th, the 5th, now comprehended in and forming the) Second Residency. Abstract of the Work executed up to the 1st June, 1831, and estimated as yet to be executed.

No. of SECTION.	CONTRACTORS.	GRUBBING.		EXCAVATION OF THE CANAL.							
				COMMON EARTH.				HARD PAN.			
		Done.	To be done.	Work done.		Work to be done.		Work done.		To be done.	
		Dolls.	Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.
41	Plater, Helm, and Fletchall -	-	-	19,078	1,526	4,122	515	-	-	-	-
42	Plater, Helm, and Watkins -	-	-	16,650	1,332	5 900	472	-	-	-	-
43	Ditto - -	200	-	22,251	2,044	5,400	540	-	-	-	-
44	Plater, Helm, and Plater -	-	-	18,200	1,820	20,000	2,000	-	-	-	-
45	Ditto - -	-	-	34,985	3,349	25,253	2,879	-	-	-	-
46	Ditto - -	75	-	22,760	1 593	350	52	-	-	-	-
47	T. Crown and Stephen Sands -	25	-	26,292	2,149	-	-	-	-	-	-
48	T. Crown and Dennis Shannon -	25	-	20,320	1,779	17,000	2,550	-	-	-	-
49	Higgins, Owens & Owens - -	60	-	25,900	2,302	2,706	270	-	-	-	-
50	Higgins, Owens & Gumaer -	100	-	23,000	2,760	-	-	6,500	910	2,000	280
51	Ditto - -	5	-	10,590	947	6,548	655	3,565	499	7,000	980
52	Higgins, Owens & Owens - -	5	-	20,966	2,272	4,004	560	-	-	-	-
53	Higgins, Owens, Costigan & Co. -	75	-	17,060	1,817	8,475	1,186	-	-	-	-
54	Ditto - -	10	5	20,566	2,308	8,680	1,215	-	-	-	-
55	Fletchall, Burns & Levarty -	50	-	20,659	2,073	2,600	286	-	-	-	-
56	Offutt & Beall - - -	15	-	20,180	1,816	-	-	-	-	-	-
57	Spalding, Ford, Congor & Co. -	-	-	32,500	3,250	7,000	700	-	-	-	-
58	T. M. McCubbin - - -	15	5	17,300	1,557	2,000	180	5,285	1,057	5,000	1,000

59	Nicholls & Co. and O'Neale & Henesy	95	5	18,740	1,686	600	54	4,680	1,170	1,400	350
60	Bennett & O'Neill - -	40	5	14,800	1,332	7,600	1,140	600	150	-	-
61	Kemp, Waldo, Barry & Dooley -	20	15	17,552	1,821	4,000	480	800	144	1,000	180
62	Kemp, Waldo, Kavenaugh & Co. -	43	-	34,424	3,158	6,000	900	-	-	-	-
63	Jared Darrow & Co. - -	200	-	35,128	2,986	-	-	25,392	6,348	-	-
64	Do - - -	100	-	22,058	1,765	-	-	19,981	4,995	-	-
65	Darrow & Millerd - - -	185	-	25,328	2,198	3,000	300	50	7	-	-
66	Almon H. Millerd - - -	300	-	11,000	1,100	2,700	270	20,200	3,925	5,900	1,180
67	Brackett & Co. and Hempstone & Co.	100	-	13,310	1,065	4,590	367	160	38	40	10
68	Do - -	120	30	17,600	1,805	7,200	792	700	136	-	-
69	Helliker, Beers & Co. - -	70	20	18,900	2,079	2,000	220	50	8	1,100	176
70	Brackett & Tainter - -	70	-	26,442	2,526	800	120	880	167	-	-
71	McIntosh & Bennett - -	600	-	10,180	1,018	4,600	460	4,792	1,198	4,000	1,000
72	Johnson, Roach & Bargy -	262	-	18,891	2,223	4,000	500	1,633	253	-	-
73	Roach & Bargy - - -	70	55	7,160	895	1,600	200	-	-	-	-
74	Gatton & Co. and Roach & Bargy -	-	-	5,772	478	240	30	3,100	620	-	-
75	Bennett, McIntosh & Hempstone -	15	-	11,620	813	4,220	506	1,040	135	-	-
76	Do - - -	30	-	10,350	725	7,750	930	-	-	-	-
77	E. M. Gatton & Co. - -	-	-	13,050	1,044	-	-	369	166	-	-
78	Hurd, Canfield & Co. - -	38	-	30,580	2,430	-	-	270	76	-	-
79	Do - -	70	-	22,230	1,890	-	-	750	225	-	-
80	Do - -	24	-	25,834	2,067	-	-	3,855	1,272	-	-
81	Do - -	68	-	29,259	2,926	2,600	260	2,210	773	-	-
82	Do - -	240	-	17,200	1,720	300	30	-	-	-	-
83	Do - -	489	-	11,020	1,102	-	-	210	69	-	-
84	Kemp & Elliott - - -	25	-	15,568	1,214	2,155	216	1,700	340	-	-
		3,934	140	873,253	80,760	185,994	21,835	108,772	24,681	28,840	5,646

SECOND RESIDENCY. ABSTRACT OF WORK—Continued.

No. of SECTION.	EXCAVATION—Continued.								EMBANKMENT.				No. of SECTION.
	QUARRYING.				BLASTING.				OF EARTH FROM CANAL EXCAVATION.				
	Work done.		Work to be done.		Work done.		Work to be done.		Work done.		Work to be done.		
	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cubic yds.	Cost. Dolls.	
41	-	-	-	-	-	-	-	-	818	102	-	-	41
42	-	-	-	-	-	-	-	-	-	-	2,940	225	42
43	-	-	-	-	-	-	-	-	1,660	249	3,600	540	43
44	-	-	-	-	-	-	-	-	-	-	-	-	44
45	-	-	-	-	-	-	-	-	-	-	-	-	45
46	-	-	-	-	-	-	-	-	1,786	36	-	-	46
47	-	-	-	-	-	-	-	-	610	37	-	-	47
48	-	-	-	-	-	-	-	-	-	-	400	16	48
49	-	-	-	-	-	-	-	-	4,818	417	2,000	250	49
50	-	-	-	-	-	-	-	-	5,180	571	1,000	80	50
51	-	-	-	-	-	-	-	-	1,120	90	6,000	615	51
52	-	-	-	-	-	-	-	-	950	76	250	20	52
53	-	-	-	-	-	-	-	-	5,146	463	8,900	1,240	53
54	-	-	-	-	-	-	-	-	-	-	2,500	200	54
55	-	-	-	-	-	-	-	-	1,900	247	1,000	130	55
56	-	-	-	-	-	-	-	-	-	-	-	-	56
57	-	-	-	-	-	-	-	-	4,950	743	3,000	450	57
58	60	27	-	-	16	13	-	-	2,000	224	3,000	330	58
59	72	18	-	-	-	-	-	-	500	70	800	160	59

60	-	-	-	-	-	-	-	-	-	720	-	18	2,000	300	60
61	-	-	-	-	-	-	-	-	-	300	-	8	1,000	100	61
62	-	-	-	-	-	-	-	-	-	300	-	8	1,700	51	62
63	73	28	-	-	14	6	-	-	-	7,040	-	870	-	-	63
64	1,114	434	-	-	8,775	3,949	-	-	-	33,383	9,178	-	-	-	64
65	153	57	-	-	22	11	-	-	-	220	18	-	-	-	65
66	1,500	450	1,000	350	11,475	6,426	4,000	2,240	-	8,300	1,361	-	9,000	1,530	66
67	-	-	-	-	-	-	-	-	-	1,220	122	-	3,680	368	67
68	-	-	-	-	-	-	-	-	-	2,320	218	-	3,100	279	68
69	60	21	500	175	-	-	-	-	-	-	-	-	-	-	69
70	-	-	-	-	-	-	-	-	-	900	108	-	800	96	70
71	2,850	1,140	700	280	5,220	3,393	6,900	4,485	-	4,880	569	-	6,000	1,200	71
72	706	171	-	-	30	23	-	-	-	6,360	636	-	1,420	142	72
73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73
74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74
75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75
76	-	-	-	-	-	-	-	-	-	500	40	-	-	-	76
77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77
78	-	-	-	-	-	-	-	-	-	260	18	-	-	-	78
79	-	2	-	-	5	3	-	-	-	-	-	-	-	-	79
80	5	-	-	-	-	-	-	-	-	-	-	-	-	-	80
81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81
82	10	4	-	-	15,110	12,378	220	220	-	4,870	395	-	-	-	82
83	-	-	-	-	185	139	-	-	-	-	-	-	-	-	83
84	-	-	-	-	678	339	-	-	-	2,500	129	-	1,000	60	84
	6,603	2,352	2,200	755	41,530	26,680	11,120	6,945	105,216		16,913		65,090	8,382	

SECOND RESIDENCY. SUMMARY OF WORK—Continued.

No. of SECTION.	EMBANKMENT—Continued. OF EARTH NOT FROM CANAL EXCAVATION. Work done. Quantity. Cubic yds.	Work done. Cost. Dolls.	Work to be done. Quantity. Cubic yds.	Work to be done. Cost. Dolls.	PUDDLING. Work done. Quantity. Cubic yds.	Work done. Cost. Dolls.	Work to be done. Quantity. Cubic yds.	Work to be done. Cost. Dolls.	WALLING. OF STONE FROM CANAL EXCAVATION. Work done. Quantity. Perches.	Work done. Cost. Dolls.	Work to be done. Quantity. Perches.	Work to be done. Cost. Dolls.	No. of SECTION.
41	500	44	-	-	-	-	-	-	-	-	-	-	41
42	760	66	-	-	-	-	-	-	-	-	-	-	42
43	-	-	-	-	-	-	-	-	-	-	-	-	43
44	-	-	-	-	-	-	-	-	-	-	-	-	44
45	-	-	-	-	-	-	-	-	-	-	-	-	45
46	-	-	700	70	-	-	-	-	-	-	-	-	46
47	180	18	-	-	-	-	-	-	-	-	-	-	47
48	-	-	-	-	-	-	-	-	-	-	-	-	48
49	-	-	-	-	-	-	-	-	-	-	-	-	49
50	-	-	-	-	-	-	-	-	-	-	-	-	50
51	-	-	-	-	-	-	600	150	-	-	-	-	51
52	-	-	-	-	-	-	-	-	-	-	-	-	52
53	-	-	-	-	-	-	-	-	-	-	-	-	53
54	-	-	-	-	-	-	-	-	-	-	-	-	54
55	-	-	600	78	286	71	-	-	-	-	-	-	55
56	370	30	-	-	-	-	-	-	-	-	-	-	56
57	-	-	-	-	36	11	-	-	-	-	-	-	57
58	834	83	2,000	220	500	125	400	100	-	-	-	-	58
59	1,375	284	2,000	460	-	-	-	-	144	108	-	-	59

60	-	-	3,000	600	-	-	-	-	-	-	-	-	60
61	-	-	-	-	-	-	-	-	-	-	-	-	61
62	-	-	-	-	-	-	-	-	-	-	-	-	62
63	-	-	-	-	-	-	-	-	-	-	-	-	63
64	14,250	3,432	-	-	-	-	-	-	-	-	-	-	64
65	250	23	-	-	-	-	-	-	6,940	3,470	-	-	65
66	2,880	301	1,000	200	-	-	-	-	196	114	-	-	66
67	-	-	1,000	150	-	-	-	-	7,070	4,419	300	187	67
68	82	13	4,000	600	-	-	-	-	-	-	-	-	68
69	400	60	3,400	510	-	-	-	-	-	-	-	-	69
70	350	45	1,750	262	-	-	-	-	-	-	-	-	70
71	780	78	6,000	1,500	-	-	-	-	-	-	-	-	71
72	-	-	-	-	608	114	-	-	5,750	2,865	1,560	780	72
73	62,200	9,705	32,800	5,314	-	-	600	180	1,103	655	-	-	73
74	35,100	4,650	2,000	300	-	-	-	-	-	-	-	-	74
75	1,350	122	3,350	570	-	-	-	-	-	-	-	-	75
76	1,600	208	24,000	4,080	-	-	-	-	-	-	-	-	76
77	6,165	617	-	-	-	-	-	-	-	-	-	-	77
78	-	-	-	-	-	-	-	-	-	-	-	-	78
79	1,963	186	-	-	-	-	-	-	-	-	-	-	79
80	2,396	240	-	-	-	-	-	-	-	-	-	-	80
81	1,412	127	-	-	-	-	-	-	-	-	-	-	81
82	12,250	1,980	600	120	-	-	-	-	8,590	3,264	186	71	82
83	3,397	383	-	-	-	-	-	-	200	76	-	-	83
84	5,300	709	4,600	736	-	-	-	-	595	298	-	-	84
	156,144	23,404	92,800	15,770	1,430	321	1,600	430	30,588	15,269	2,046	1,038	

SECOND RESIDENCY. ABSTRACT OF WORK—Continued.

No. of SECTION.	WALLING—Continued. OF STONE NOT FROM CANAL EXCAVATION. Work done. Quantity. Perches	Work done. Cost. Dollars.	Work to be done. Quantity. Perches.	Work to be done. Cost. Dollars.	EXTRA WORK. Done. Dollars.	EXTRA WORK. To be done. Dollars.	TOTAL OF WORK DONE. Dollars.	TOTAL OF WORK TO BE DONE. Dollars.	AGGREGATE. Dollars.	No. of SECTION.
41	-	-	-	-	-	-	1,672	515	2,187	41
42	-	-	-	-	-	-	1,398	697	2,095	42
43	-	-	-	-	21	-	2,514	1,080	3,594	43
44	-	-	-	-	-	-	1,820	2,000	3,820	44
45	-	-	-	-	-	-	3,349	2,879	6,228	45
46	-	-	-	-	9	-	1,713	122	1,835	46
47	-	-	-	-	-	-	2,229	-	2,229	47
48	-	-	-	-	13	-	1,817	2,566	4,383	48
49	-	-	-	-	-	-	2,779	520	3,299	49
50	-	-	-	-	-	-	5,645	360	6,005	50
51	-	-	-	-	-	-	1,541	2,400	3,941	51
52	-	-	-	-	-	-	2,353	580	2,933	52
53	-	-	-	-	-	-	2,355	2,426	4,781	53
54	1,304	1,304	-	-	-	-	2,318	1,420	3,738	54
55	-	-	-	-	-	46	2,441	540	2,981	55
56	-	-	-	-	-	-	1,861	-	1,861	56
57	1,359	1,687	1,150	1,438	-	-	5,691	2,588	8,279	57
58	605	1,013	500	750	25	79	4,169	2,660	6,829	58
59	-	-	-	-	38	32	3,469	1,061	4,530	59

60	-	-	-	-	-	100	1,522	2,143	3,667	60
61	-	-	-	-	-	-	2,603	775	2,778	61
62	-	-	-	-	200	-	3,409	951	4,360	62
63	-	-	-	-	215	-	10,651		10,651	63
64	136	88	-	-	212	-	27,623	-	27,623	64
65	360	180	-	-	-	-	2,793	300	3,093	65
66	1,150	1,120	-	-	-	-	19,302	5,907	25,209	66
67	340	272	700	560	-	-	1,597	1,455	3,052	67
68	-	-	-	-	7	-	2,299	1,701	4,000	68
69	-	-	-	-	60	100	2,298	1,201	3,499	69
70	-	-	-	-	-	-	2,916	478	3,394	70
71	-	-	-	-	-	-	10,861	9,705	20,566	71
72	255	255	-	-	154	-	4,746	642	5,388	72
73	-	-	-	-	-	-	10,670	5,749	16,419	73
74	-	-	-	-	-	-	5,748	330	6,078	74
75	-	-	-	-	-	-	1,085	1,076	2,161	75
76	-	-	-	-	-	-	963	5,010	5,973	76
77	-	-	-	-	-	-	1,867	-	1,867	77
78	-	-	-	-	98	-	2,642	-	2,642	78
79	-	-	-	-	138	-	2,527	-	2,527	79
80	-	-	-	-	254	-	3,862	-	3,862	80
81	-	-	-	-	274	-	4,168	750	4,918	81
82	-	-	-	-	350	60	20,331	501	20,832	82
83	520	338	-	-	60	-	2,656	-	2,656	83
84	175	131	-	-	-	-	3,185	1,012	4,197	84
	6,275	6,418	2,350	2,748	2,126	413	202,858	64,102	266,960	
Locks, Nos 25, 26, and 27, 24 feet lift - - - - - -							21,704	6,467	28,171	
Lock-houses, Nos. 17, 18, and 19 - - - - - - -							2,676	-	2,676	
Aqueduct No. 2, across Monocacy river, - - - - - -							44,181	51,819	96,000	
Culverts, 30 in number - - - - - - - -							24,000	20,000	44,000	
Waste Weirs - - - - - - - - -							-	750	750	
Bridges - - - - - - - - -							250	-	250	
							295,669	143,138	438,807	

CHESAPEAKE AND OHIO CANAL—First Division. Summary of work executed to the 1st June, 1831, and yet remaining to be done between the mouth of Rock Creek and the "Point of Rocks."

	GRUBBING.		EXCAVATION OF THE CANAL.											
			COMMON EARTH.				HARD PAN.				QUARRYING.			
	Done.	To be done.	Work done.		Work to be done.		Work done.		Work to be done.		Work done.		Work to be done.	
	Dolls.	Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds	Cost. Dolls.
First Residency, -	8,722	-	809,542	83,929	9,770	960	301,540	72,493	10,316	2,461	67,480	20,961	275	90
Second Residency,	3,934	140	873,253	80,760	185,994	21,835	108,772	24,681	28,840	5,646	6,603	2,352	2,200	755
Totals, -	12,656	140	1,682,795	164,689	195,764	22,795	410,312	97,174	39,156	8,107	74,083	23,313	2,475	845
Average, - -	-	-	Per yard 9 7–10		Per yard 11 6–10		Per yard 23 6-10		Per yard 20 7–10		Per yard 31 4–10		Per yard 34 1-10	
Common average, -	-	-	Per yard 9 9–10				Per yard 23 4–10				Per yard 31 5–10			
General Average, -	-	-	Of excavation per yard 21 9–10											

Total quantities of excavation done, yards cubic, 2,549,510; to be done, yards cubic, 252,920. Total, 2,802,430 cubic yards.

FIRST DIVISION. SUMMARY—Continued.

	EXCAVATION CANAL—Continued.				EMBANKMENT.							
	BLASTING.				OF EARTH FROM CANAL EXCAVATION.				OF EARTH NOT FROM CANAL EXCAVATION.			
	Work done.		Work to be done.		Work done.		Work to be done.		Work done.		Work to be done.	
	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.
First Residency,	340,790	258,615	4,405	3,329	389,579	48,348	15,120	1,431	684,547	140,769	31,845	6,121
Second Residency,	41,530	26,680	11,120	6,945	105,216	16,913	65,090	8,382	156,144	23,404	92,800	15,770
Totals,	382,320	285,295	15,525	10,274	494,795	65,261	80,210	9,813	840,691	164,173	124,645	21,891
Average,	Per yard 74 7-10		Per yard 66 2-10		Per yard 13 4-10		Per yard 12 2-10		Per yard 19 5-10		Per yard 17 6-10	
Common average,	Per yard 74 4-10				Per yard 13				Per yard 19 2-10			
General average,	Of excavation per yard 21 9-10				Of embankment per yard 16 9-10.							

Total quantities of embankment done, yards cubic, 1,335,486; to be done, yards cubic, 204,855. Total, 1,440,341 cubic yards.

FIRST DIVISION. SUMMARY—Continued.

	PUDDLING.				WALLING.							
					OF STONE FROM CANAL EXCAVATION.				OF STONE NOT FROM CANAL EXCAVATION.			
	Work done.		Work to be done.		Work done.		Work to be done.		Work done.		Work to be done.	
	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Perches.	Cost. Dolls.	Quantity. Perches.	Cost. Dolls.	Quantity. Perches.	Cost. Dolls.	Quantity. Perches	Cost. Dolls.
First Residency,	75,771	20,035	7,748	2,140	177,874	96,735	5,131	3,291	7,117	6,324		
Second Residency,	1,430	321	1,600	430	30,588	15,269	2,046	1,038	6,275	6,418	2,350	2,748
Totals,	77,201	20,356	9,348	2,570	208,462	112,004	7,177	4,329	13,392	12,742	2,350	2,748
Average,	Per yard 26 3-10		Per yard 27 5-10		Per perch 53 7-10		Per perch 60 3-10		Per perch 95 1-10		Per perch 116 9-10	
Common average,	Per yard 26 4-10				Per perch 53 9-10				Per perch 98 4-10			
General average,	Puddling per yard 26 4-10				Of walling per perch 57							

Total quantities of Puddling done, yards cubic, 77,201; to be done, yards cubic, 9,348. Total, 86,549 cubic yards.
Walling done, perches, 221,854; to be done, perches, 9,527. 231,381 perches.

FIRST DIVISION. SUMMARY—Continued.

	EXTRA WORK.		LOCKS, 27 IN NUMB'R.		LOCK HOUSES.		CULVERTS.		AQUEDUCTS.	
	Done.	To be done.	Done.	To be done.	Done.	To be done.	Done.	To be done.	Done.	To be done.
	Dollars.									
First Residency, -	25,144	3,375	227,055	5,587	13,615	2,700	50,418	1,454	14,212	9,232
Second Residency -	2,126	413	21,704	6,467	2,676	-	24,000	20,000	44,181	51,819
Totals, -	27,270	3,788	248,759	12,054	16,291	2,700	74,418	21,454	58,393	61,051

Average cost per foot lift, $1,201 90-100.—47 68-100 miles, average cost per mile, $37,051 94-100

FIRST DIVISION. SUMMARY—Continued.

	GUARD LOCK, FEEDERS, AND DAMS.		BRIDGES, and work done at market-space, Georgetown.		PIER, BASIN, &c. at mouth of Rock Creek, and Waste Weirs, gen'y.		IMPROVEMENTS.	TOTAL of work done.	TOTAL of work to be done.	AGGREGATE.
	Done.	To be done.	Done.	To be done.	Done.	To be done.				
	Dollars.									
First Residency, -	44,824	10,071	29,715	3,210	82,850	4,712	22,902	1,207,666	60,164	1,327,830
Second Residency, -	-	-	250	-	-	750	-	295,669	143,138	438,807
Totals, -	44,824	10,071	29,965	3,210	82,850	5,462	22,902	1,563,335	203,302	1,766,637

NOTE.—If from the above aggregate cost of construction of the canal from the mouth of Rock Creek to the Point of Rocks, viz: - $1,766,637
there be deducted the cost of constructing sections A and B, and their incidental works, amounting to - - - - - - 309,000

1,457,637

and there be added the cost of constructing the 12 miles of canal, from the Point of Rocks to Harper's Ferry, as estimated by A. Cruger, resident Engineer, preparatory to its actual construction along the left bank of the Potomac, - - - - - - - 250,000

the total estimated cost of the sixty miles to Harper's Ferry, will be, - - - - - - - - - - 1,707,637

Or an average (exclusive of contingencies) of, per mile, - - - - - - - - - - - - 28,460
Or, making due allowance for that portion of section B which lies above Georgetown, and adding the cost of the new locks into Rock Creek, which, if not constructed there, must have been placed above that town; and making allowance also for such part of the past expenditures of the Company, as properly belong to the works below Harper's Ferry, although not included in the cost of their construction, the cost of the sixty miles of the canal above Georgetown may be computed at, per mile, - - - - - - - - - $31,000

OFFICE OF THE CHESAPEAKE AND OHIO CANAL COMPANY, *Washington, June* 1, 1831.
JOHN P. INGLE, *Clerk.*

ESTIMATE

BY THE

UNITED STATES' ENGINEERS

OF THE PROBABLE COST, EXCLUSIVE OF GRUBBING, LAND RIGHTS, AND CONTINGENCIES,

OF THE

CHESAPEAKE AND OHIO CANAL

BETWEEN

GEORGETOWN AND HARPER'S FERRY.

STATEMENT shewing the estimate, by the United States' Engineers cies, of the Chesapeake and Ohio Canal, between Georgetown an the water surface, 33 feet at the bottom, and 5 feet depth of water completing the same portion of the Canal with a breadth generall depth of water, exclusive of land rights, fencing, and contingencies

SUBDIVISIONS.	LENGTH.		GRUBBING.
	Miles.	Yards.	Dolls.
7th SUBDIVISION—Extending from below Harper's Ferry to the mouth of Monocacy, according to the estimate of the United States' Engineers,	19		-
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st June, 1831,	18	338	3,187
8th SUBDIVISION—Extending from the mouth of Monocacy to Seneca creek, according to the estimate of the United States' Engineers,	19	580	-
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st of June, 1831,	19	631	3,924
9th SUBDIVISION—Extending from Seneca to the head of the Great Falls, according to the estimate of the United States' Engineers,	8	1,100	-
Do.—Actual cost to the 1st of June, 1831,	8	641	3,391
10th SUBDIVISION—Extending from the head of the Great Falls to tide below the Little Falls, according to the estimate of the United States' Engineers,	11	1,023	-
Do.—Actual cost to the 1st of June, 1831,	10	1,005	3,992
11th SUBDIVISION—Extending from tide below the Little Falls to Georgetown, according to the estimate of the United States' Engineers,	2	880	-
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st of June, 1831,	2	880	365
Total cost of Eastern Division, according to U. S. Engineers,	61	63	-
Do. do. by the Eng'rs of this company,	58	1,755	14,859

Note.—The cost of the four locks located *in* Georgetown is here included in the actu because the same lockage is included by the United States' Engineers in their 10th Sub

of the probable cost, exclusive of grubbing, land rights, and contingen-
Harper's Ferry, with a breadth, where easily obtained, of 48 feet at
compared with the actual cost, so far as executed, and estimated cost of
of sixty feet at the water surface, 42 feet at the bottom, and 6 feet

EXCAVATION OF THE CANAL.

COMMON EARTH.		QUARRIED ROCK.		BLASTED ROCK.		AGGREGATE.	
Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.
-	-	-	-	-	-	787,050	180,081
-	-	-	-	-	-	772,930	100,185
-	-	-	-	-	-	891,900	168,580
1,017,678	114,558	12,911	4,316	47,670	28,900	1,078,259	147,774
-	-	-	-	-	-	593,200	73,389
413,630	55,586	10,530	3,181	80,442	67,202	504,602	125,969
-	-	-	-	-	-	758,050	374,219
326,700	44,469	20,317	5,872	165,844	131,981	512,915	182,322
-	-	-	-	-	-	370,800	104,326
220,442	32,567	32,731	10,783	74,715	42,564	327,888	85,914
-	-	-	-	-	-	3,401,000	900,595
1,978,450	247,180	76,543	24,152	368,671	270,647	3,196,584	642,164

st of the 11th Subdivision, which is made only to extend *to* Georgetown. This is done.
livision.

STATEMENT

SUBDIVISIONS.	EMBANKMENT.	
	Quantity. Cub. yds.	Cost. Dolls.
7th SUBDIVISION—Extending from below Harper's Ferry to the mouth of Monocacy, according to the estimate of the United States' Engineers,	165,440	33,088
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st June, 1831,	415,207	89,957
8th SUBDIVISION—Extending from the mouth of Monocacy to Seneca creek, according to the estimate of the United States' Engineers,	195,800	19,160
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st of June, 1831,	414,813	70,413
9th SUBDIVISION—Extending from Seneca to the head of the Great Falls, according to the estimate of the United States' Engineers,	190,080	38,016
Do.—Actual cost to the 1st June, 1831,	163,923	38,417
10th SUBDIVISION—Extending from the head of the Great Falls to tide below the Little Falls, according to the estimate of the United States' Engineers,	150,860	35,386
Do.—Actual cost to the 1st of June, 1831,	501,133	92,133
11th SUBDIVISION—Extending from tide below the Little Falls to Georgetown, according to the estimate of the United States' Engineers,	46,400	9,280
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st of June, 1831,	174,634	19,684
Total cost of Eastern Division, according to U. S. Engineers,	748,580	134,930
Do. do. by the Eng'rs of this company,	1,669,710	310,604

—Continued.

WALLING.		AQUEDUCTS.		LOCKS.					
				LOCK PROPER.		INCIDENTALS: Excava. and Embankm't.	GUARD LOCKS, DAMS, AND FEEDERS.	LOCK HOUSES.	
Quantity. Cub. yds.	Cost. Dolls.	Length Yards.	Cost. Dolls.	In number.	Cost. Dolls.	Dolls.	Dolls.	In number.	Cost. Dolls.
52,806	158,400	33	48,825	3	36,000	-	28,000		
37,713	43,738	-	12,000	4	32,000	-	24,600	4	2,800
27,466	82,398	120	112,673	3	36,000	-	47,167		
34,454	25,036	172	96,000	3	28,771	-	-	3	2,645
61,052	183,156	102	52,623	4	43,000	-	5,272		
41,267	24,198	45	23,444	4	30,819	1,606	24,000	4	3,800
49,550	167,550	-	-	22	260,250	-	25,360		
77,013	43,287	-	-	16	135,975	26,618	38,000	10	8,500
14,080	42,240								
27,685	18,438	-	-	4	32,000	-	-	1	204
204,954	633,744	255	214,121	32	380,250	-	105,797		
218,132	154,697	-	131,444	31	259,565	28,224	86,600	-	17,949

STATEMENT

SUBDIVISIONS.	WASTE WEIRS.		CULVERTS.	
	In number.	Cost. Dolls.	In number.	Cost. Dolls.
7th SUBDIVISION—Extending from below Harper's Ferry to the mouth of Monocacy, according to the estimate of the United States' Engineers, - -	3	1,200	23	7,500
Do.—Actual expense and estimated cost of completion, by the Engineers of this company to the 1st June, 1831,	-	690	29	23,220
8th SUBDIVISION—Extending from the mouth of Monocacy to Seneca creek, according to the estimate of the United States' Engineers, - - -	3	1,690	29	10,200
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st June, 1831,	-	750	26	38,137
9th SUBDIVISION—Extending from Seneca to the head of the Great Falls, according to the estimate of the United States' Engineers, - - - -	1	400	20	6,000
Do.—Actual cost to the 1st of June, 1831, - - -	-	1,127	10	12,413
10th SUBDIVISION—Extending from the head of the Great Falls to tide below the Little Falls, according to the estimate of the United States' Engineers, - -	3	3,600	16	4,800
Do.—Actual cost to the 1st of June, 1831, - - -	-	3,506	12	20,300
11th SUBDIVISION—Extending from tide below the Little Falls to Georgetown, according to the estimate of the United States' Engineers, - - - -	-	-	6	1,800
Do.—Actual expense and estimated cost of completion, by the Engineers of this company, to the 1st of June, 1831, - - - -	-	3,605	4	15,233
Total cost of East. Division, according to U. S. Engineers, -	10	6,800	96	30,300
Do. do. by the Eng'rs of this company,	-	9,678	81	109,353

The item of "Sundries," includes disbursements for general improvement of the canal the bottoms of such sections as had settled upon the admission of water into it, &c. &c., as

—Continued.

BRIDGES.		PUDDLING.		PAVING.		FENCING.		SUNDRIES.	AGGREGATE.
In number.	Cost. Dolls.	Quantity. Cub. yds.	Cost. Dolls.	Quantity. Sq. yds.	Cost. Dolls.	Dist. Miles.	Cost. Dolls.	Dolls.	Dolls.
19	6,700	37,400	4,488	3,000	2,430	19½	17,550		524,262
-	2,250	-	-	-	-	-	-	1,598	335,625
11	3,900	38,080	4,569	10,560	8,553	19	17,100	-	511,900
-	250	7,108	1,858	2,216	277	-	-	1,869	417,704
5	1,900	112,200	13,464	-	-	8½	7,650	-	429,868
-	-	5,533	1,375	15,389	2,489	-	-	6,267	299,315
6	2,000	117,810	14,136	-	-	11½	10,350	-	897,651
-	1,900	28,800	7,564	23,992	4,590	-	-	33,907	602,594
5	2,100	2,640	448	-		2½	2,250	-	162,444
-	-	42,480	12,064	9,350	1,361	-	-	4,785	193,703
46	16,600	308,130	37,105	13,560	10,983	61	54,900	-	2,526,125
-	4,400	83,924	22,861	50,947	8,717	-	-	48,426	1,848,941

below Seneca, in widening and raising embankments, and filling up, to their proper level, follows:

9th Subdivision, - - -	2,000
10th Subdivision, - - -	19,909
11th Subdivision, - - -	902
Making the sum of - -	$22,811

Report of Col. John J. Abert and Col. James Kearney, of the United States' Topographical Engineers, upon an examination of the Chesapeake and Ohio Canal from Washington City to the "Point of Rocks;" made by order of the Secretary of War, at the request of the President and Directors of the Chesapeake and Ohio Canal Company.

THE PRESIDENT AND DIRECTORS OF THE CHESAPEAKE AND OHIO CANAL COMPANY:

In meeting, May 6, 1831.

The following preamble and resolution were adopted, to wit:

Whereas the Legislature of Pennsylvania have requested their Senators and Representatives to apply to the Congress of the United States for the subscription of an additional million to the stock of the Chesapeake and Ohio canal; and the attention of the stockholders, at the approaching general meeting, will, of necessity, be attracted to this subject; with a view to co-operate with the generous purpose of that Commonwealth: Be it

Resolved, That the President of the company be, and he is hereby, authorized to address a letter to the Secretary of War, requesting that the Board of Internal Improvement of the United States may be instructed to examine and report to the department the present condition of the Chesapeake and Ohio canal, along with their judgment of the plan adopted therefor, and the execution and cost thereof.

And be it further resolved, That the engineers and other officers of the company be, and they are hereby, required to afford every facility within their power to such officers of the United States' Board of Internal Improvement, as may be deputed to make the preceding examination and report.

Extract from the journal of proceedings.

Attest: JOHN P. INGLE,
Clerk of Ches. and Ohio Canal Co.

A letter was received from Col. John J. Abert, notifying that an order had been issued, directing the survey, as requested, and to which the following reply was made:

CANAL OFFICE, *Washington, May* 20, 1831.

Col. J. J. ABERT:

DEAR SIR: I have just received your letter of the 13th instant. An order will be forthwith forwarded and delivered to Mr. Thomas F. Purcell and Mr. Daniel Vanslyke, to attend you as far as the Great Falls, where the 1st and second residencies into which the canal was distributed, below that point, terminated during its construction. At the Great Falls, Mr. Cruger, the engineer of the 3d residency—now part of the 1st—will be ordered to meet you, and to accompany you through the residue of the late 3d and the 4th and 5th residencies. Mr. Purcell will proceed with you to the end of the present 1st residency, which extends to the 40th section, or about three miles above Seneca. The books of the various residencies will show the prices of the work executed; but if, in any instance, defective, that defect can be readily supplied in Washington.

Our board had some time ago, fixed on Saturday, the 21st, (to-morrow) for an examination o' the entire line below the "Point of Rocks," with a view to draw to our aid some small streams or the Great Monocacy, so as to

fill the part of the canal, now nearly done, below that river; and I presume it would best answer your purpose, to be left unembarrassed by our presence, in the discharge of the duty you have to perform. But, if, at any time, for any purpose whatever, my assistance, or that of any director of the company, can prove of any use to the prosecution of your labors, I beg you to command mine, and I am confident you will find the like disposition to accommodate you on the part of the directors.

I will instruct our clerk to forward to you a comparative statement of the actual cost of the various subdivisions of the canal, according to our contracts, and of the estimated cost, by Messrs. Bernard, Poussin and Howard, then constituting the United States' Board of Internal Improvement; in the examination of which, in relation to the plan of the canal contemplated by the latter, and now executed, I ask your attention to the difference of the proposed, and real depth and breadth of the two works.

I am, dear sir,
With sincere respect,
Your obedient servant,
CHARLES F. MERCER,
President Chesa. and Ohio Canal Company.

To Charles Fenton Mercer,
President of the Chesapeake and Ohio Canal Company:

I have the honor to lay before you, for the information of yourself and the Board of Directors, the accompanying report from the Engineer Department, made by two officers of the Topographical Corps, agreeably to the request of the stockholders of the Chesapeake and Ohio Canal Company, to the President of the United States.

Very respectfully,
J. H. EATON.

To Brig. Gen. Gratiot, *Chief Engineer U. S. A.*

Sir: In obedience to your orders of the 11th of May, we have made the examination of those parts of the Chesapeake and Ohio canal which are "completed and under construction," and have now the honor to report the result of our observations.

The first part of the work which we visited, was the basin at Georgetown. This basin is formed by a dam thrown across the mouth of Rock creek, forming an extensive quay or landing place, one of its faces being on Rock creek, and the other on the Potomac river. The length of the quay on the Potomac face, is one thousand and eighty feet: two hundred feet of which is occupied by a tumbling dam, for the delivery of the surplus water of this creek, and thirty-eight feet occupied by the tide lock, leaving eight hundred and forty feet front on the Potomac river. Piles, each one foot in diameter, were driven throughout the whole extent of the river front, touching each other, and then at every three feet of the interior, to a distance of twelve feet, until they refused a pile driver of eleven hundred pounds. The whole of these piles were then connected by heavy timbers, bolted to the head of

each pile, and this frame work was then united by a course of hewn timbers fitting close to each other, and five inches thick, and well secured to the frame and piles. On the front of this pile work, there is a well laid dry wall, twelve feet thick, and seven feet high, including the coping. Strong and frequent ties of timber firmly connected with the pile work, are extended under the soil of the quay. Until these were fixed, a slight curving had been observed in a part of the wall, but, since that time, not the least indication of yielding is perceptible, nor do we think there is any just ground of fear for the durability of this part of the work. It stood without injury the unusual freshet of the river of the last spring, on the breaking up of the ice.

The width of the quay is one hundred and sixty feet, except at the city end, where it narrows to eighty feet. Sixty feet in width of the centre of this quay, is intended for ware-houses and stores, and the rest of the space is to be left open for streets and landing places.

A bridge is constructed over the head of the tumbling dam, connecting the Georgetown part with the city part of the quay. This bridge is of timber, on piles—a simple, but substantial structure.

The inside of the quay forming the Rock creek face, is protected by a well laid dry wall, surmounted by a stout hewn timber coping, bound to its place by tie-timbers extending some distance into the soil. The whole of the space between these two fronts, is already filled up with earth.

The walled face of the basin also extends upon both sides of Rock creek, to the second bridge, constituting an entire length of walling on the inside of the basin of five thousand five hundred feet, (about 300 feet of the wall is yet to be laid,) and inclosing an area of eight and one-quarter acres.

But the real extent of this basin is much greater, as the water of this creek, when raised by the dam at the quay, will be deep and navigable up nearly to Patterson's paper mill, and will extend over an area about twice as great as that included between the walls.

About six thousand cubic yards of earth yet remain to be removed from the space between the walled parts of the basin.

The communication between the basin and river is effected by a tide lock resting upon piles. These piles are of one foot diameter, driven at every four feet, with a pile driver of eleven hundred pounds. After the piles are driven home, and cut to a uniform level, a heavy frame of square timber, bolted to the head of each pile, connects the whole of the piles together. Over this frame three courses of two-inch plank are laid, alternately crossing each other, and the whole united by tree-nails to the frame and piles; and upon this prepared foundation the masonry of the lock is built. The inside and outside courses of the lock walls is range work, with hammered faces, of the Aquia creek freestone; the interior or backing of these walls is rubble work of granite. The range work is laid in hydraulic cement, and the whole of the interior of the wall is carefully grouted with cement at every range. The wall of the lock on the side next to the tumbling dam, is twelve feet thick; that of the opposite side, is eleven feet.

One end of one of the walls of this lock—the end next to the river of the upper wall—moved soon after it was built, and before the mortar had set, drawing the masonry out, but without breaking a stone, leaving an opening at the hollow quoin of about seven-eighths of an inch. It has not moved since that period; but, as it has not been used, this defective part has not as yet been exposed to the pressure of the water. We do not think it secure in its present condition, and it may probably be found necessary to reconstruct this end of the lock.

The canal communicates with the basin which we have just described, by means of a lock, being lock No. 1, of the canal line.

This is a stone lock, faced with the Aquia creek freestone, and has the appearance of a good piece of masonry. One end, however, of one of the side walls—the end which joins on to the basin—has, from a defect in the foundation, yielded at the hollow quoin, and left an opening of about one inch.

The chamber of this lock is 100 feet long by 15 feet wide, and it has a lift of 8 feet, but it has not yet been in use, and has, consequently, not yet been exposed to the pressure of the water. The masonry appears remarkably well, except at the defective end of which we have just spoken, the durability of which we are disposed to doubt. *

Between this and the next lock, No. 2, there is a small pool, 100 feet long by 46 feet wide, and enclosed by a stone wall, generally well constructed, but at places there appears to have been too many small stones admitted. At the head of this pool a stone bridge has been thrown over the canal for the accommodation of Green street; the passage under the arch is as wide as a lock.

Lock No. 2, is immediately adjacent to this bridge; it is of the same kind of masonry, of the same dimensions, and on the same plan, as No. 1. There is no evidence whatever of yielding in any part of this lock, nor has it as yet been in use.

The pool between this lock and the next above it, is also small, being 120 feet long by 46 feet wide; its sides are secured by dry stone walls; there is a drain from the streets of the town into this pool. It would, of course, have cost more to have conducted this drain along the side of the canal until it could have discharged itself into the basin, but considering the small size of the pool, and the quantity of deposit which will be washed from the street into this pool, we think it would have been a better course, notwithstanding the increased expense; but, it should be added, that the water may be drawn off in about twenty minutes from the pool, and it may then be cleaned.

At the head of this pool there is another stone bridge similar to the last, for the accommodation of Washington street, and adjacent to this bridge is lock No. 3.

This lock is of the same dimensions, style of masonry, plan, and lift, as the locks previously noticed. There is another small pool between this and the next lock, 120 feet long by 46 wide, with its sides protected by a wall of dry masonry. There are stone steps on each side of these pools, conducting to their bottom; and, in relation to the size of the pools, it ought in justice to be remarked, that the nature of the ground which they occupy does not admit of their being larger.

At the upper end of this last pool, there is another stone bridge similar to the last, for the convenience of Jefferson street, and adjacent to this bridge is lock No. 4.

This is the last of the lift-locks in Georgetown, and is similar, in all respects, to those previously remarked upon. From this lock the canal maintains throughout the town a width of 46 feet and a depth of 6.

The next street crossed by the canal line is Congress street, for the accommodation of which there is a stone bridge with a span of 40 feet. All

* Since we examined this lock, we have been informed that the defective end has been taken down, and that it is to be rebuilt from the foundation.

these bridges are very neat and substantial structures, faced with the free-stone of Aquia creek, well laid, and with hammered faces; the locks are also faced with the same kind of stone, wrought in the same manner. We are disposed to think that neither the texture of this stone, nor its specific gravity, is of a kind to have encouraged its use in such structures, particularly in the locks; but in justice to the practiced judgment of the engineer, we feel bound to add, that the locks above, (which have been in use about a year,) and which are faced with the same kind of stone, stood the excessive and long continued frosts of the last winter without the least injury.

Proceeding along the line of the canal, the next structure we encountered was the bridge for the accommodation of High street; the span of this is to be 54 feet; the abutments are partly completed, and the centering for the arch is erected, and as much of the work as is done, is certainly of a very substantial character: from this bridge to the market-house, on the next street, the work is in active progress. A vast deal of rock was encountered between Congress and Market streets, the greater part of which has been already removed: about 3,000 cubic yards yet remain to be blasted between High and Market streets. As this part of the line passes through a densely settled part of the town, the blasting could not be pursued with as effective an activity as in other places, from the necessity of using small charges of powder.

The next street beyond High street is the one in which the market-house is erected; the canal passes under this house, and two substantial wooden bridges are built immediately on each side of it.

There is then a wooden bridge for the accommodation of Duck lane and one for Frederick street.

The whole of the canal which passes through the town is to be rivetted by a stone wall, the greater part of which is already built, and is a specimen of good work.

The first culvert on the line is the one for Market street run; it has a span of eight feet, and is well built.

At the upper end of Georgetown the embankment of the canal is sustained by a strong dry stone wall on its outside. As the wall had shown some indications of yielding to the pressure of the earth, strong buttresses had been constructed to aid it. The water has not yet been let into this part of the canal, and the stability of the wall has not therefore been tested by this additional pressure. The canal, its bottom as well as embankment, for a great distance in its line on each side of its wall, has been carefully puddled.

The width of the canal up to Frederick street, is 46 feet, and its depth 6; from this street, it gradually widens to eighty feet, and increases in its depth to seven, which it maintains through the remaining part of this level up to lock No. 5. This increase in depth of one foot in a part of this level, appears to us a hazard to the embankments and culverts, not compensated by any adequate advantages.

College Creek, which passes between the town and Mason's Foundry, is admitted directly into the canal, but as its bed is much lower than the bottom of the canal, no bad effect can result from the deposit it will occasionally bring down.

This bed isthirty feet below that of the canal, and when the latter is filled, this part of it will be exposed to a pressure of thirty-seven perpendicular feet of water. Considering this fact and its consequences, it might appear to an observer, as a better course, to have constructed a culvert for the de-

livery of this creek. It so appeared to us, but on inquiry of the resident engineer, Mr. Purcell, he informed us that the subject had been carefully studied, and the soil examined to a great depth, and found treacherous and unsafe, and that if a culvert had been constructed, its durability was very doubtful, and the cost would have been much greater than the method ultimately adopted of embanking over the pass, and admitting the creek into the canal.

There is a small wooden bridge over this creek for the accommodation of the public road, which occupies that side of the canal bank. It is sustained by two massive abutments of dry masonry, in which the stone appear to be remarkably well laid.

From this bridge up to Mason's Foundry, the canal is still sustained on the river side by a high embankment, and its opposite side, on which the road passes, is rivetted by a very fine perpendicular wall of dry masonry. At the Foundry there is also a strong stone wall outside of, and sustaining, the embankment.

The second arched culvert is immediately at Mason's Foundry, for the delivery of the Foundry stream and for a roadway. The arch does not appear to have yielded at any place, but several of the ring stones, which are of the Aquia Creek stone, have broken or split off at their outer surfaces. The sheeting is of rubble work, and many of the stone, for such work, do not appear to have been well chosen. The use of a great deal of mortar is evident from the intrados of the arch, and it is also apparent, in places, that the beds of the sheeting stone are not sufficiently extensive.

We know it to be a common practice with builders in our country to use rubble stone for the sheeting stone of arches; but in cases with as great a span as this arch possesses, and in which the work has to support a canal, we doubt the propriety of the practice. Even in arches of a less span, where rubble stone sheeting is used, great care should be bestowed on the choice of the stone, and in laying it.

The water had been let in a few days before our visit, to a depth of three feet over this culvert, but had been drawn off the day before, in consequence of a slight breach in the embankment a short distance above. When we examined it, there were but two or three inches of water left upon it. It leaked, however, considerably, perhaps sufficiently to justify fears of its stability, when exposed to a full pressure of seven feet of water, unless some precautionary measures be taken. There was no crack or rupture in the masonry, the leak was between the stones of the sheeting and of the upper abutment.*

The level is continued from lock No. 4, in Georgetown, to lock No. 5, near the Little Falls, throughout a distance of about four miles. We have already spoken of as much of this level as extends up to the culvert at Mason's Foundry, from which, up to lock No. 5, the great dimensions of the canal are preserved. The side of the canal next to the river is sustained by a heavy and high embankment, rivetted at its base, by a substantial stone slope wall wherever it is exposed to the action of the river, and the interior slope of this embankment is lined throughout nearly the whole of this distance, by a stone wall, rising from the bottom of the embankment, and resting upon its slope. The opposite bank of the canal, over which the road to

* We have been informed, since our visit, that the puddle work over this culvert had cracked from too long an exposure to the sun; that it is now repaired, and that the water is again over this culvert to a depth of three feet, and that it does not now leak.

the Little Falls passes, is sustained by a well constructed perpendicular wall wherever the road is immediately adjacent to the canal, and where it extends back a short distance, the bank is generally rivetted by a slope wall.

Between the Foundry culvert, and lock No. 5, there are two or three places, where small streams are let directly into the canal. We do not consider this a good plan. From the precipitous character, and the loose texture of the hills which are drained by these streams, the deposit from them into the canal will be considerable, and the filling up, in the form of bars or shoals, must be a consequence.

When it is not considered advisable to construct culverts for such streams, we think some method should be adopted to catch the deposit before it arrives into the canal.

The stream of Ewell's powder mill passes under the canal, by means of an arched culvert.

Culverts are not only advantageous for these immediate objects, but also to deliver the water from back drains, the formation of which, we believe, will be found necessary wherever the canal is located, at the base of this extensive range of hilly land.

Near the locks of the old canal, and which are within the distance heretofore stated, there is a roadway passing under the canal, for the convenience of the fish landing below the Little Falls. This structure is an arched stone culvert, with a span of fifteen feet three inches. A full head of water has been upon it for about nine months, but no leak is visible, nor is there the slightest evidence of yielding. To all appearances, it is a well built and durable structure.

We omitted to mention that we first observed water in the canal, at a point about one mile above Mason's Foundry, from which it is in actual use up to the Seneca feeder.

A short distance below lock No. 5, is a wooden bridge, thrown over the canal, for the accommodation of the public road, to the Little Falls bridge. This is sufficiently elevated above the level of the canal to admit of the passing of the packet boat without inconvenience to passengers upon its upper deck. The structure is simple but substantial, and the towing-path is extended under it by means of a small bridge, so that there is no necessity of freeing the horse from the tow-rope while passing it.

Lock No. 5, is the first on the portion of the canal now filled with water. At the foot of this lock a feeder is taken in from the Potomac. This feeder is a part of the old canal, and receives its water at about half a mile from the lock, and above it. A well constructed arched stone dam is here thrown across the river, to insure a sufficient elevation and supply of water. There is an island in the river where this dam is situated. The entire length of the dam, when completed, will be seventeen hundred and fifty feet. The distance from the eastern shore of the river, to the island in the line of the dam, is eight hundred and fifty-five feet, which is the extent of the dam now constructed.

Lock No. 5, is similar in its plan, dimensions, and materials, to those we have before spoken of. It appears to have been faithfully built, and is very tight.

The great dimensions of the canal heretofore stated, terminate at this lock, beyond which the width at the water surface, is sixty feet, and the depth six.

About twelve hundred feet above lock No. 5, is lock No. 6. The canal in this distance is judiciously located, and durably constructed. Lock No. 6 is similar to No. 5, and deserves the same commendation.

Between lock No. 6 and lock No. 7, the length of canal is about one mile and a half. In this distance, much of the embankment is exposed to the action of the river, against which it is, however, carefully protected by a well laid and substantially built stone wall, resting against the slope of the embankment, and rising to its top.

The use of Aquia creek free stone appears to have ceased at lock No. 6. Lock No. 7 is composed entirely of granite, and has the appearance of faithful workmanship and of great durability.

About half a mile above lock No. 7, is a fine arched stone culvert, for the passage of Cabin John creek. It has every appearance of being a faithfully executed piece of work, exhibiting not the slightest evidence of yielding or of leaking. It is one hundred and twelve feet long, the span or chord of the arch twenty two, and its rise five feet. If any expression of regret might be indulged, in relation to this excellent structure, it would be that the span of the arch is not greater; its rise could not be from the level which was considered advantageous to preserve to the canal which passes over it. It has, in one instance, not been found adequate to the free delivery of the water of the creek, which rose above the embankment and flowed into the canal. The freshet to which we now allude, is believed to have been a very unusual one, and much increased by a simultaneous rise in the Potomac. The canal suffered no injury from the rise; but should this prove to be a property of this creek, of more frequent occurrence than is now anticipated, it may become advisable to construct another arched culvert near to the present one. We deem it, however, a duty to the engineer, to add, that this is one of those cases better to be known by experience than to have been readily anticipated.

From this culvert to lock No. 8, which is one mile and a half, the embankment of one side of the canal again touches the river, but is protected from its action by a strong and well laid stone wall, rising to the top of the embankment.

Lock No. 8, is of the same dimensions, plan, and lift, as those below. It is the first with which we have met, which has the facing, or front range of its walls, made with the red sand stone of Seneca creek. We consider this an excellent stone, and well adapted to the use to which it is applied; inferior, however, to granite. The quarries, (as do all quarries,) furnish stone of various qualities, and great attention should be bestowed on the choice of the pieces. We were informed that these are, in all cases, subjected to a rigid inspection before they are admitted into the work: those exposed to our view, were evidently well chosen.

From lock No. 8 to lock No. 9, the length of canal is 1,440 feet. The embankment next to the river is here again rivetted by a well laid and strong slope wall of stone, extending to its top, and the inside slope is also rivetted in the same way. Between No. 8 and No. 9, there are two well made arched stone culverts.

Lock No. 9, is somewhat different from those below, being laid entirely in cement mortar, and not grouted in any part. It had leaked a little from the front of the walls, soon after it had been first used, but a careful pointing with cement had since entirely remedied this. We saw no leak whatever. This lock is built of granite, except the coping, which is of Aquia creek stone.

We have as yet made but few remarks on the method of building, as we mean to go into some details on this subject after we have completed a general itinerary of the line.

From No. 9 to lock No. 10, the length of canal is 300 feet. It has every appearance of having been well made.

Lock No. 10 is built entirely of granite. It is a fine structure, extremely tight, and has every appearance of durability. We take this opportunity to remark, that all the locks previously noticed were also tight. We saw no leaking or spouting from the walls, and we examined them immediately after each was emptied, when such defects, if they exist, will always show themselves.

From No. 10 to lock No. 11, the length of canal is 600 feet. Near to lock No. 11, and between it and No. 10, there is a skewed arched culvert for the delivery of Rocky run. This culvert had yielded in some of its parts; but precautionary measures were immediately adopted, and it has since exhibited no indications of failing. It leaked rather too much in places, and we think it advisable to reconstruct the puddle work, from the base of the abutments, around the entire arch, where the leaks appear. Its length is 152 feet, the span of the arch 12, with a rise of 6.

Lock No. 11, has its front ranges of the Seneca stone, its backing of rubble granite. A small stone flume was being made around this lock to feed the lower level. This course is to be adopted for all the small pools.

From No. 11 to lock No. 12, the length of the canal is thirteen hundred and twenty feet, and is well made.

From No. 12 to No. 13, it is three hundred feet long, by seventy feet wide, and the same from No. 13 to lock No. 14. The engineer was constrained to have these small pools from the peculiar character of the ground. The locks are well built, are entirely of granite, and of the same dimensions and plan as those previously noticed, except No. 13, which passes the water through the gates, and not by a culvert through the side walls.

The canal is now continued at the same level, without interruption, for about four miles, to lock No. 15. In this distance, a well built arched road-way passes under the canal. The whole of this level is well chosen, and the work well executed. The embankment, which frequently encroaches on the river, is protected by a well built slope wall of dry masonry, rising to its top, and occasionally forty feet in height. This wall is made unusually strong, not only to sustain the pressure to which it is exposed, but also because it was the most convenient and economical way of disposing of the vast quantities of stone which had to be blasted out of the path of the canal in its vicinity.

Lock No. 15, has the front ranges of its masonry faced with the red sand stone of Seneca. It is free from any leak, shows no yielding in any part, and appears to have been faithfully built.

The length of canal, from No. 15 to lock No. 16, is about two hundred and forty yards. No. 16 is similar in plan, materials, and mode of construction, to No. 15, and equally creditable to the builder in its appearance.

From No. 16 to lock No. 17, the distance is four hundred and twenty yards. Here, again, the embankment had to encroach upon the river, from the action of which it is protected by a heavy slope wall of stone, continued up to the top of the embankment, and in places it is as high as fifty-six feet. This wall had partially yielded to the great pressure to which it is exposed, but was immediately repaired and enlarged, and is also aided by strong and well built buttresses.

In these cases, where the wall is stated as being so high, rows of plank piling were driven on the inside, and the canal filled up with earth, and se-

cured by a puddle work. Where the deep places widen into large ponds, as in the vicinity of Bear island, the inside of the embankment is judiciously and carefully secured by plank piling, and by a puddle wall.

Between No. 17 and lock No. 18, the canal is widened into a capacious pool, at the upper end of which it receives a feeder from the Potomac. This pool is three hundred feet long by one hundred feet wide.

Between No. 18 and lock No. 19, the length of the canal is three thousand one hundred and ten feet, and is well executed. These last locks (except 19) are all similar to each other, and to those previously noticed. The fronts range-work, with hammered faces, of the Seneca stone—the backing of rubble granite. And lock No. 19 differs from these only in its lift, which is nine feet.

From No. 19 to lock No. 20, the distance is four hundred feet.

This last lock has the general lift of the locks of this canal of eight feet, and completes the series necessary to surmount the elevation of the "Great Falls" of the Potomac.

The line of the canal from the Little Falls to this lock was replete with difficult passes, which the engineer appears to have attacked with boldness and intelligence, and to have admirably surmounted.

At this lock, we found an excellent hotel, kept by Mr. Fenlon. The house is built upon the ground of the company, and with the company's funds, and is a necessary and great accommodation to those who visit this interesting work.

From lock No. 20 to No. 21, the length of the canal is two miles and a quarter. It is a carefully executed piece of work. The embankment, wherever exposed to the river, is protected from its action by a well constructed and substantial wall of dry masonry, and generally rivetted also on the inside slope, by a wall rising from the bottom of the canal.

Between No. 20 and lock No. 21, there are two well constructed culverts, which appeared to be perfectly tight and of an enduring character.

Lock No. 21 is similar to those previously noticed, and has all the appearances of faithful work, is tight, and exhibits no evidence of yielding.

There is an arched culvert near the head of this lock, in which we observed two or three places where it leaked. It appeared to require some attention.* There are also, between 21 and 22, two other small arched culverts, perfectly tight, and with every appearance of faithful workmanship. We observed also in this distance, a paved ford, to accommodate the adjoining farms. This ford can be conveniently used when the water in the canal is about four feet deep—when deeper, it is contemplated to use a large boat at this place; for which purpose docks are constructed on each side of the canal, that the boat may lie out of the canal line. Within the limit before stated, there is also a culvert for the delivery of Watt's branch. This is a large arched culvert, and to all appearances well built. Not the least leaking was visible. Its length is one hundred and fifteen feet; the span or chord of the arch twenty, with a rise of ten feet. The length of canal line, between locks 21 and 22, is three miles. Throughout the greater part of this distance, the embankment on the river side is sustained by a beautiful and well built sloping stone wall of dry masonry, rest-

* We have since understood that it has experienced a slight breach, and is now undergoing a thorough repair. But in candor we must add, that we saw no sufficient grounds for apprehending any such disaster.

ing upon a judiciously laid footing, and rising to the top of the embankment; the inside slope of which is rivetted also with a slope wall, laid from the bottom of the canal. There is one continued line of two miles of this walling, curving with the canal, in which we did not observe the slightest indication of yielding or of weeping in any part of it. In parts of this line the rock excavation was very great, and the superfluous stone is judiciously placed outside of the walling, and in a manner to relieve it from the current of the river.

Lock 22 has a lift of seven feet, but is, in other respects, similar to those which we had previously examined. Between this lock and No. 23, the length of the canal is three miles. It is a well executed piece of work, having much of its embankment protected from the river by a well laid stone wall, founded upon a broad footing.

A short distance beyond No. 22. there is a well made arched culvert for the delivery of Muddy branch. It rests upon a rock foundation, and shows no leak or evidence of yielding.

Lock No. 23 is the next which we examined, and the last in the extent of the canal, now filled and in active use, constituting in its present condition, a distance of about twenty-one miles of canal navigation. We have already remarked upon the appearance and execution of the work thus far, and have spoken generally of the dry walling. We were particularly struck with the extent and excellence of this part of the work, and of the judicious collection in places of the superfluous stone, forming masses projecting into the river, and aiding to turn its current from the walls. But there were places where the superfluous stone were thrown indiscriminately over the wall, and allowed to take whatever course they would, covering the wall irregularly from its base. This had a very unfinished appearance, but it was the most economical disposition that could be made of the stone, and aids the wall in its resistance. The stone were thrown over in a manner to avoid injuring the wall; and where this method of disposing of the stone was observed, it was at places where any violent action of the river is not to be apprehended.

Lock No. 23 has a lift of eight and a half feet, and immediately adjacent to it is a guard and lift-lock, No. 24, communicating with the Potomac river.

These two locks were laid throughout with the cement, or hydraulic mortar, and no grout was used. The facing, or front ranges of masonry, are of the red sand-stone of Seneca. They had the appearance of faithful workmanship. We were informed, that, at one time, a spouting of water had been observed from the side walls of these locks, immediately after being emptied; but we observed nothing of the kind when we examined them.

The canal is fed from the river through the guard and lift-lock, No. 24. It is generally called the Seneca feeder. An arched stone dam, two thousand five hundred feet long, and adapted to raise the water six feet above low water mark, is here thrown across the river, and directs the water into the lock. The chamber of this lock is of the same size as that of the lift-lock. It is in active use in passing boats between the canal and the river, and bestows the advantages of the canal to the country on both shores.

The method of admitting the water into all the lift-locks we have passed, is, with one exception, by a walled well and culvert, constructed in the masonry of the side-walls of the locks. The discharge into the lock-chamber

is by three rectangular openings on each side of the locks, under the water, and at the bottom of the lock. The opening into the well from the level above, is regulated by a cast iron paddle-gate, turning on a pivot.

This plan admits the water without violent ebullition, and avoids a forcing of the boat against the gates. We found it generally agreeable to the officers of the canal, but that the frequent breaking of the paddle-gates were subjects of complaint. This method, though often alluded to, by writers on these subjects, has not, we believe, been elsewhere so generally adopted, nor do we consider it as having any marked advantages over that now frequently followed, of having the upper gate to extend to the bottom of the lock, and of admitting the water through the lower part of the gate by a common pivot valve, or by a valve raised by rack-work.

The admitting of the water by a well and culvert, lessens the strength of the side-walls, requires more care in workmen than is usually obtained, and a more vigilant inspection of the work. The passages are liable to be choked up by billets of wood and by stones; and the plan presents difficulties, and occasions great expenses, when repairs are required, while it, at the same time, exposes a greater surface to accidents. For ourselves, we think, the more simple these structures are, and the more accessible to repair, the better.

The gates of the locks are tight, well made, and remarkably well hung. They fit to the hollow quoins with great exactness, are well balanced, and generally move with ease. We were particularly struck with the secure anchoring of the upper hinge. The irons extending well over the masonry, and being imbedded and firmly bolted to it.

The usual time employed in the passing of a lock, by the packet boat, is four minutes. A passage, however, may be readily effected in three minutes and a half; and we were informed, that, in an experiment of several passages, the average of the time occupied was but three minutes.

We observed many well constructed waste gates, but there appeared to us a singular deficiency of waste weirs. We consider these last as necessary to the security of a canal, as they act of themselves, and discharge the superfluous water before it can rise so high as to overflow and injure the embankments.

We now proceeded to examine the work above the Seneca feeder. As the construction of this part of the canal is in progress, it afforded us an excellent opportunity of witnessing the excavations, and the methods of building.

The trunk of the canal is excavated, and the embankment nearly finished, from the feeder, (or from lock 23 of the canal line, which is the lift-lock adjacent to the feeder,) to the Seneca river, a distance of about three-quarters of a mile. Over this river an aqueduct is constructing. The abutments and piers, which rest upon a rock foundation, are completed, the centering is up, and the arches partly turned. The masonry is to be entirely of the red sand-stone of Seneca.

The length of the aqueduct, from the face of one abutment to the face of the other, is one hundred and fourteen feet. It will consist of two piers and three arches. The span of each arch is thirty-three feet, and the thickness of each pier seven feet. The sheeting, as well as the ring stone, are to be cut to the proper angle, and the whole of the arch work is to be laid in cement, and grouted carefully over the extrados. The front or facing ranges of the piers and abutments, is laid in cement or hydraulic mortar,

and the interior of the masonry carefully grouted with cement at every range. No stretcher is admitted with a bed less than its face, and no face is less than a foot wide, and the length of each stretcher must be not less than four feet. No header is admitted that does not extend into the masonry at least four feet, and with a face one foot high, and two feet long. The spandrills are to be built up with rubble stone, and grouted with cement at every range.

The stone, before being used, are subjected to a rigid inspection, and if an improper piece finds its way into the work, it is ordered out as soon as discovered.

The masonry of the lower abutment of the aqueduct is connected with a lift-lock, and the width of the canal over the aqueduct is the same as that of a lock chamber. This lock, No. 25, was also in progress.

We believe that this structure will be both beautiful and enduring, and that it presents the best method of passing the stream, even if its water should hereafter be wanted to feed the level between the aqueduct and lock 26.

From the aqueduct, we passed along the excavated part of the canal to Horse-pen run. A culvert was constructing for the delivery of this run, the abutments of which are completed. The stone used are well selected and well laid. Another culvert, at a short distance above this, had its abutments partly raised.

We then continued our examination up to lock No. 26. This lock is eight miles beyond the Seneca aqueduct. Nearly the whole of the excavation, in this distance, is completed, the tow-path formed, and the culverts in a state of active execution.

Lock No. 26 was nearly completed, the walls were up, and in want only of a part of the coping stone, which the workmen were then laying. The timber for the gates was also framed, and ready to be put together. The whole of this work had the appearance of faithful execution, and a judicious choice of materials.

A pivot-bridge is to be thrown over this lock, to accommodate the road to Edwards's Ferry. This bridge was made, and ready to be placed upon the lock.

Near to the head of this lock, there is a well-built arched culvert, for the passage of a small stream, and for the convenience of a back-drain. The foundation of this is of timber, and so situated as to be always under water. Each end of the culvert is protected by a firmly-driven series of plank-piling, extending five feet below the foundation. The masonry is laid in hydraulic mortar, and then grouted, and the whole is to be covered by a puddle-work, which last yet remained to be completed.

About one mile beyond lock No. 26, there is constructing an arched stone culvert, for the delivery of Broad run. It will have a span of sixteen feet. The masonry of the abutments is completed, and ready to receive the skewbacks. The abutments appeared to be well laid, and the stone used, equally well selected.

Broad run may be taken in as a feeder, at a point about three quarters of a mile from the canal.

A short distance from the last, there is another culvert of six feet span, for the delivery of Abraham's branch, and soon again another of four feet span. This last is finished, and is a good piece of work.

At Hillary's farm, the pit for an arched roadway was dug out, and preparations were in activity for the construction of the work. About 500 feet

further on, there is another arched culvert of six feet span, for the delivery of a small stream, and also to accommodate the back drains. This culvert was being built, and showed good work and well chosen stone.

One mile from the roadway at Hillary's farm, another arched roadway is in progress. The work was completed to the height of the abutments, and is a fine specimen of masonry. The passage between the abutments is ten feet wide. The centering is to be erected, and the arch completed immediately.

Three quarters of a mile further, a pit is excavated, and part of the foundation laid for another roadway, intended for the convenience of Conrad's ferry. As much of the masonry as is executed, deserves commendation.

We cannot forbear here expressing our decided approbation of this method of crossing canal lines over the more usual method by bridges. Its many conveniences to those who use these roadways, as well as to the canal, should, in all cases, give to them a preference, where the ground is adapted to their construction.

The next lock above is No. 27, and is eight miles from No. 26. We have already enumerated the works of masonry in this last distance, and have described the state of forwardness in which we found them. One or two small culverts, for drains, completely finished, have escaped particular remark: we looked at them, however, and found them, to all appearances, well executed. The excavation of the canal trunk, and the formation of the tow-path, were also well advanced. In fact, the earth to be removed, appeared to us but little more than was necessary to form the embankments and the canal over the several works of masonry in progress, and we were informed that it was left for these purposes.

Lock No. 27. The pit of this lock was completely excavated, the foundation laid, and some of the masonry raised a few feet. The stone were well chosen, and the joints of the range work square and close. The work was progressing actively and in good faith.

We examined, at the same time, a quantity of stone brought for the use of this lock, and lying on the river bank. They were of the red sand stone of Seneca, and are remarkably fine pieces.

A short distance above this lock, there is a skewed culvert constructing, for the passage of a small stream, and also to answer for a roadway. The abutments of this work are completed and ready for the skewbacks, and have every appearance of faithful work.

Mr. Cruger, the engineer for this part of the line, also showed us the ring stone prepared for this arch, and explained, in an intelligent and satisfactory manner, the principles on which they were cut.

About half a mile beyond this culvert, there is another, for the passage of a small stream. This, excepting a few ranges of the wing walls, was completed, but not yet covered with earth, and was entirely exposed to our view. The work had a very enduring aspect, and every appearance of faithful execution.

The entire distance between the last lock and No. 28, is two miles; in which the excavation of the canal was also nearly completed.

Lock No. 28 is rather more advanced than No. 27, and shows similar evidence of faithfulness in its execution.

From No. 28 to the aqueduct over the Great Monocacy, is about half a mile. On this distance we passed the Little Monocacy, for the delivery of

which a culvert is being made. The foundation is laid, and the walls of the abutments are nearly completed. The stone used in this work are fine, and it has every appearance of durability.

Between this and the aqueduct over the Great Monocacy, the canal is to be enlarged into a basin, 500 feet long by 100 feet wide.

It may be proper to remark, that, in the whole length of the canal from the aqueduct over the Seneca to that over the Monocacy, wherever the embankment touches upon the river, it is carefully protected against its action by extensive and well constructed walls of dry masonry.

These walls, so frequently mentioned in our report, might, without explanation, be considered objects of extravagance; we will therefore add, that the valley of the river, occupied by this canal, is bounded, to a great extent, by high, rocky cliffs, which in many places, project into the water, leaving to the engineer no other course than to blast his path through them, and to establish the foundation of his embankment in the river itself.

The next object of our examination was the aqueduct over the Great Monocacy. This structure is 438 feet long from the face of one abutment to the face of the other, and the masonry of the abutments and wing walls extends ninety-six feet further. The whole work will consist of two abutments, six piers and seven arches. The masonry of the abutments and piers, rests upon the solid rock which forms the bed of the river, and which had been previously cleaned and prepared for the purpose.

The arches are to be fifty-four feet in the span, with a rise of nine feet: The two arches which rest against the abutments, are conducted, within the abutments, by what is called a blind arch, down to the rock foundation. The centering of one arch is up, the masonry partly laid, and preparations were in activity for erecting other centres.

The piers and abutments are thirty-three feet four inches long, exclusive of the pilasters. The piers are ten feet wide above the water table, and fourteen feet wide and thirty-eight feet long at the foundations, which last dimensions are preserved up to within one foot of the low water surface.

These piers (except one) and the abutments are now erected, and nearly in a condition to receive the skewbacks.

When the masonry is brought up to the point before stated, an offset is constructed entirely around each pier and the faces of the abutments, after which the range work with hammered faces commences.

The first course of range work is twenty-six inches high, and reduces the abutments to thirty-three feet four inches long, and eleven feet thick. The second is twenty-four inches high, preserves the same length to the abutment, but reduces its thickness to ten feet. There are then three additional courses, one of twenty-two inches, one of twenty inches, and one of eighteen inches high, which bring the piers and abutments to the desired elevation for receiving the spring stone or skewbacks of the arch. The work of these piers and abutments is a system of headers and stretchers, except the interior or backing, which is composed of rubble stone. The stretchers are four feet long, and none are admitted with a less width of bed than two feet. The headers have a front two feet long, and have to extend not less than five feet into the masonry. Their beds are all cut so as to be parallel. This range work is laid in cement or hydraulic mortar, and the interior or backing, carefully grouted with the same material.

The ring stones of the arches are cut by a pattern, furnished to the contractor, and are to extend into the masonry three feet, and five feet alter

nately. The depths of these stones are so arranged as to be three feet at the spring of the arch, and to decline gradually to two feet six inches at the crown.

The sheeting stone are also cut to the same angles as the ring stones and to range well with them.

The whole of the arch masonry is also to be laid in hydraulic mortar, and the entire extrados of the arch is then to be carefully grouted.

The canal passage is to be eighteen feet six inches wide at the bottom, and nineteen feet six inches at the water surface, with a depth of six feet.

The work, when completed, is to be surmounted by an iron balustrade.

Mr. Cruger, the resident engineer, showed to us also the specifications of this work, (which form a part of the contract with the builder,) describing the manner in which it was to be executed, and the dimensions of its various parts. We observed at the foot of these specifications, the name of the celebrated civil engineer, Judge Wright, who was formerly in the employ of the company.

A temporary railroad has been constructed to the quarry, from which the stone for this work is obtained, and which is situated about three miles back from the river. We visited the quarries. The stone lies high, and is of easy access; its color a dull white. It is of the kind usually called by workmen mountain granite, but by geologists it would be called a gray wacke. It splits well, hammers without fracture, is fine grained, and, in our opinion, a very lasting stone.

The work was executing in good faith by the contractor, and was vigilantly watched and inspected by the engineer. We consider the plan judicious as well as its execution, in which are united the true principles of economy, usefulness and durability.

After having completed this examination we crossed the Monocacy, and continued up the excavated part of the canal. A short distance beyond the Monocacy there is an arched culvert for the delivery of the Little Tuscarora. It extends one hundred and thirty feet under the canal and its embankments, with a span of twelve feet. It has every appearance of faithful work. One and a half miles farther, there is another culvert of sixteen feet in the span of the arch. In addition to the delivery of a small stream, this culvert is also intended to serve for a roadway. It is about half done, and is a well executed piece of work. From this we continued to the "Point of Rocks," where the excavation for the canal at present terminates, and near to which there is another arched culvert, completed and well executed. In all this distance from the Monocacy, of five and a half miles, in which there is no lock, the canal trunk is excavated, the tow path formed, and the works of masonry in a state of forwardness; and, with the exception of the Monocacy aqueduct, we see no reason to doubt that the entire line from the "Point of Rocks" to the Georgetown basin, a distance of about forty-eight miles, might be in readiness, without extraordinary exertions, to receive its water by November next. Our doubts in relation to the completion of this aqueduct, by the time just stated, arise more from the severity and length of the sickly season in that locality, than from any opinion that this work is not also within the limit of ordinary exertion.

All the Lock-keepers' houses are good stone structures; with one exception, and this is a good frame house.

The tow-path, throughout the entire line, is upon the embankment next to the river, and is no where less than twelve feet wide.

We have already spoken, in the course of this narrative, of the method pursued in building the aqueducts; we will now add, generally, that which is followed in relation to the culverts and the locks.

In all cases where a rock foundation can be conveniently obtained, it has been resorted to; the rock carefully cleaned, its loose and defective parts removed, and the required extent of surface levelled to receive the masonry. Where the lock was not accessible, and the earth after excavation, did not appear sufficiently firm, it was carefully rammed and paved with stone, before the timber foundation for the masonry was laid. Where the earth was judged to be sufficiently firm, the timber was at once laid upon it without further preparation. And in proof that the foundations have been carefully secured, we can bear our testimony, that in no instance whatever, except in tide lock, and in lock No. 1, at the Georgetown basin, did we perceive any yielding of the masonry, which could be attributed to any defect in the foundations.

The curve of the culvert arches is generally a semicircle: where the span is four feet, the average thickness of the arch is fourteen inches; where the span is six feet, the average thickness of the arch is eighteen inches; where the span is eight feet, the average thickness of the arch is twenty inches; and where the span is twelve feet, the average thickness of the arch is twenty-four inches. The sheeting stone of these arches is rubble stone; but all are to have good fair beds, with their joints dressed with the hammer, each stone having a good binding length. The sheeting is laid in hydraulic mortar, and then grouted with the same material; and the whole, including the abutments, is protected with a puddle-work two and a half feet thick.

The ring stones of the culverts are carefully cut, and have hammered faces. Those for a four foot span, are twelve inches deep; for a six foot span, fourteen inches deep; for an eight foot span, sixteen inches deep; and for a twelve foot span, eighteen inches deep. These stone are required to extend into the arch, alternately, from fifteen to thirty inches, in culverts of a four foot span, and from twenty to forty inches for those of a greater span. For the wing and parapet walls, the stone have hammered faces, are well bedded and jointed, and the work is surmounted by a coping ten inches thick and two feet wide.

These culverts are all of an admirable length, extending well and sufficiently through the embankments.

When the pit is prepared for a lock, a strong frame of timber is laid, united and leveled. This frame work consists of ninety pieces of timber, eighty-two of thirty feet in length, and eight of thirty-eight, squaring ten inches by twelve. The whole is then covered by a course of two and a half inch plank, well secured to the timbers. A second course of planking is also laid from above where the culvert opens into the lock, to three feet below the lowest opening of the culvert. Three courses of plank piling are driven five feet below the timber frame, one at the head, one at the foot, and one at about the centre of the frame work, before the planking is applied. This frame-work extends over a width of thirty feet, and a length of one hundred and forty-one, and is the prepared foundation for the masonry. The main walls of the lock are seven feet thick, with a buttress of one foot from the head to three feet below the lowest opening from the culvert, and are continued at this thickness for a height of three feet. The wall then falls in one foot, but not the buttress, and maintains this thickness of six feet to its top.

All the facing stone, in every part of the lock exposed to view, is cut and coursed with parallel beds. No range is admitted less than one foot thick, nor with less bed than its face, and each stretcher is to be four feet long. A header is required to every ten feet, to extend not less than four feet into the wall, and to be two feet long at its exposed face. The coping stone are not less than twelve inches thick and three feet wide.

After the masonry is finished, an additional course of two inch plank is laid throughout the whole of the chamber, and below the lower gates, and an embankment of earth is raised against the back of the walls, and up to their height.

The range-work of these walls is laid in cement or hydraulic mortar; the backing, or dead wall, which is of rubble stone, is carefully grouted with the same material at every range.

These are the general principles and methods which have governed in the masonry of this canal, varied in some instances according to the discretion of the engineer. We are assured that they have been the guide in such works as have been completed, and we had proof, in our examination, that that they were observed in such as were being made.

There is no lock built upon an inverted arch.

We are fully aware, that, after all we have said, we have not yet given an adequate idea of the great and interesting work we have been directed to examine. The difficulties which have been surmounted—the quantity of labor it has received—the vast amount of rock excavation—the extent and excellence of the walls of dry masonry—the durable aspect of all the structures—the great and imposing dimensions of the canal—the judicious adaptation of the excavations to the fillings and embankments—can be duly appreciated only by visiting the work.

The trade of the canal in the part now in use is very active; there is, however, a necessity for a system of regulations to govern the boatmen. The use on the canal of the iron pointed boating poles should be entirely and immediately prohibited.

In our examination we were accompanied by Mr. Purcell, and Mr. Cruger, resident engineers, and Mr. Vanslyke, superintendent of repairs.

Mr. Purcell accompanied us throughout the extent under his charge, from the basin at Georgetown to three miles beyond the Seneca; and Mr. Cruger, who joined us at the Great Falls, remained with us until we completed our examination at the Point of Rocks. We are under many obligations to these gentlemen for their polite and intelligent attentions. They drew our notice to every part of the work—were anxious that it should undergo the most minute inspection, and pointed out to our attention those parts at which some defects had been discovered, with the confidence of men who were conscious that all usual care had been bestowed in the first instance, and that any liberal and intelligent mind would attribute these defects to their proper causes.

In stating the extent which these gentlemen superintend, we desire to be understood as merely referring to circumstances at the period of our visit. We do not know how long each has had the parts stated under his charge, nor what changes, in this respect, have ever been made. Our object is not to attach responsibility, or praise, or blame to any one, but merely, in giving a simple narrative of what we saw, and its condition, as free from personal application as possible, to name the officers of the company who were with us, and to whom we are indebted for so many of our facts of distances and dimensions.

The resolution of the Board of Canal Directors, which accompanied your order, requested also an investigation of the cost of the canal. We find that, were we to enter upon this subject it would much delay, and much extend our report, which may already be considered as having arrived at a repulsive length. We have therefore to request, that this part of the examination may not be insisted upon, and the more especially, as the board itself furnishes frequent and authentic statements of the expenditures.

There remains now but one subject for our remarks, and that is the general plan of the canal, by which we mean its location, and its dimensions, breadth, and depth. The location involves considerations of cost—of security from freshets, and of unembarrassed construction of the culverts and aqueducts. We have not yet collected the data, which would justify us in any other opinion on this point, than that from appearances all these considerations have been duly weighed by the engineer. In relation to the width and depth, we will merely say, that as engineers, we would have been perfectly satisfied, had we found these to have conformed to the advice of the United States' Board of Internal Improvements, as expressed in its able report of October, 1826, and we think it may yet be found expedient to adopt these dimensions above Harper's Ferry.

Respectfully submitted,

JOHN J. ABERT,
Lieut. Col. and Topographical Engineer.
JAMES KEARNEY,
Lieut. Col. and Topographical Engineer.

WASHINGTON, *June* 18, 1831.

(F.)

Extract from the report of the United States' board of Internal Improvement, accompanying the President's message to both Houses of Congress, of the 7th of December, 1826.

"PLAN AND ESTIMATE OF THE CANAL.

"The transverse section of the canal is exhibited on the sheet no 3. The breadth at the bottom is 33 feet; at the surface, 48 feet; the depth of water, 5 feet; the tow path, 9 feet wide; the guard banks, 5 feet at the top; the surf berms, kept on the level of water, 2 feet wide each; the tow path, and top of the guard bank, 2 feet above the surface of the canal.

"This transverse section is to be modified where local circumstances require it, and more especially in the cases of deep cutting, steep side cutting, embanking, and also where the canal is supported by walls. In the framing of the plan, a due attention has been paid to these modifications, with a view to conciliate the convenience of the work with the strictest economy. The depth of 5 feet has been preserved throughout the line, but the breadth has been often much lessened. As to the surf berms, they are intended to protect the slopes from being washed off, as also to lessen the resistance opposed to the boat, by affording to the eddy water a free passage.

"We must submit, however, the reasons which led us to propose the above dimensions.

"The experiments made in 1775, by the French academicians, (D'Alembert, Condorcet, and Bossut,) have shown: 1. That the resistance of water to the perpendicular motion of a given plane may be regarded as proportional to the square of the velocity; 2. That, the velocity being the same, the resistance of water may be considered as proportional to the area of the plane; 3. That these results obtained only in the case of an indefinite expanse of water; 4. That, in narrow canals, the resistance increases in a more rapid ratio than the square of the velocity.

"To attenuate, as much as practicable, this inconvenience, researches have been made to ascertain what should be the ratio between the transverse section of the canal and the transverse section of the boat, in order that the boat might move through such a canal as through an indefinite expanse of water. Experiments made on the subject by the celebrated Chevalier Dubuat have shown that, to attain this result, the cross section of the canal ought to be, with moderate velocities, 6.46 times the cross section of the boat, and the water line 4¼ times the breadth of the boat.

"Adopting, to preserve uniformity, 13½ feet for the breadth of the boats used on the Chesapeake and Ohio canal, (which is the breadth of the Erie canal and of the Ohio canal boats,) if we suppose the draft to be three feet, the prow to be rectangular, and the sides and bottom of the boat to conform to it, the cross section of the boat will be 40.5 square feet. Taking, now, this area 6.46 times, we find 261⅔ square feet for the cross section of the canal, through which the boat would not meet with a greater resistance than through an indefinite expanse of water. The water line should be 60⅔ feet, that is four times and a half the breadth of the boat.

"Were not expense to be taken into consideration, these dimensions might be recommended; but fitness of the work and strict economy must be reconciled as much as practicable, and it is in such a view that smaller dimensions are to be fixed upon.

"It is to be remarked, that the distance from Georgetown to Pittsburg, in following the line of canal, is 341¾ miles, which, at the rate of 2½ miles per hour, will be travelled in about - - - - 136 hours.
The ascent and descent, amounting together to 3,158 feet, will require, at the rate of 1 minute per foot, about - 52

Distance, in time, from Georgetown to Pittsburg, - 188 hours.

"Though a number of canals, selected among those executed to this day, might afford together the distance and lockage found for the Chesapeake and Ohio canal, yet there is not, within our knowledge, any line of the same extent requiring even 1,800 feet of ascent and descent taken together; the Erie canal requires 688 feet for 362 miles; the line from Liverpool to London, 1,451¼ feet for 264 miles; the canal from the Rhone to the Rhine, connecting Lyons with Strasburg, has about 1,458 feet of lockage for a length of 200 miles. The proposed canal has, therefore, as to time, a decided inferiority, when compared to a canal of the same length, but having a less amount of lockage; and it becomes, in the present case, indispensable to remedy this inconvenience. The means we propose consist in the increase of the dimensions of the cross section of the canal, with a view to compensate by a greater weight transported without additional power for the virtual increase of distance caused by so great an amount of lockage.

"We have shown that this section ought to be 261 square feet, with a water line of 60 feet, to procure a boat 13 feet 6 inches in breadth, the advantage of

moving on the canal as on an indefinite extent of water. After many trials and minute calculations, we have concluded to adopt, for the contemplated canal, the $\frac{4}{5}$ of the foregoing results, viz: for the cross section, 208 square feet, and for the water line 48 feet; and from these data we have framed, with a depth of five feet, the general transverse profile of the canal as exhibited on the sheet No. 3.

"Let us now compare this profile to one having 40 feet at the surface, 28 feet at bottom, and 4 feet in depth—the boat used being the same for both, and having 13½ feet in breadth, and 3 feet draft.

"We find by calculations, that, the velocity remaining the same, the resistance to the boat moving in the 48 feet canal, is to the resistance to the same boat moving in the 40 feet canal, as 1.21 to 1.58, or as 100 to 130. Therefore, at the same rate of velocity, 100 horses will, on the 48 feet canal, perform the same work as 130 horses on the 40 feet canal; and, with the same towing power, the weight transported on the 48 feet canal will be to the weight transported on the 40 feet canal as 130 to 100.

"But the depth of the 48 feet canal being one foot greater than the depth of the other, let us examine what will be the comparative resistance of the boat being immersed 4 feet into the 48 feet canal, and but 3 feet into the other. We find, in this case, the ratio to be 1.47 to 1.58, or 100 to 107, and we infer from it that, with a gain of about seven per cent. of towing power, the weight transported on the 48 feet canal will be one-third greater than the weight transported, during the same time, on the 40 feet canal.

"The foregoing considerations show, that, in determining the transverse section of a canal of great length, and with a dividing summit level, the amount of lockage must have a due influence upon the breadth and depth of the water section. And, indeed, taking into view the great distance and considerable lockage belonging to the present case, a cross section larger than that recommended might have been suggested, had not a regard to economy, and to a competent supply of water during the dry season, forbidden it.

"However, the transverse section, as just proposed, may be deemed sufficient to fulfil, in a satisfactory manner, the main requisite for which it has been intended. And, in order to remove all doubt, let us compare, as to amount of transportation, the contemplated Chesapeake and Ohio canal with another of the same length, but whose lockage would be 600 feet only, with a transverse section of 40 feet at the surface, and 4 feet in depth.

"The rate of travelling being supposed, for both, 2½ miles per hour, and one minute allowed for each foot of lockage, 60 feet will be, as to time, equivalent to 2½ miles; and these canals will then compare as follows:

"The Chesapeake and Ohio canal, having 3,158 feet of lockage in a distance of 341¾ miles, is equivalent, as to time, to a single level canal of 473 miles, which would require 189 hours to be travelled from one end to the other.

"The 40 feet canal, having 600 feet of lockage in a distance of 341¾ miles, is equivalent, as to time, to a single level canal of 367 miles, and which would be travelled in 146 hours, from one end to the other. But it has been shown, that, on the first canal, the amount of transportation being expressed by 130, it will be 100 on the 40 feet canal—the velocity and towing power remaining the same in both cases. Comparing, now, this ratio of 130 to 100 with that of the times employed to travel, respectively, each canal, viz: 189 hours to 146, it is found that these ratios are equal. Therefore, on

either of these canals, and notwithstanding a difference of 2,558 feet lockage, an equal weight will be transported during the same time, and with an equal towing power; a result entirely due to a larger transverse section having been assigned to the canal whose lockage is greater."*

Extract from the first annual report of the President and Directors of the Chesapeake and Ohio Canal Company.

"The enlargement and elevation of the Chesapeake and Ohio canal, from the lowest dam and feeder to the entrance of the streets of Georgetown, have been prompted by a due respect for the well known object of the express condition attached to the United States' subscription of a million of dollars, added to the desire on the part of this board, sanctioned by the voice of the stockholders, of promoting the application of water power to domestic manufactures at the very advantageous sites afforded immediately above, as well as near, the termination of the canal.

"It is well understood that this cannot be effected without some injury to the navigation of the canal, for the whole, or a part of that distance, and it should not be encountered without an equivalent benefit to the company, and to the community.

"Should the pretensions of certain individual claimants, holding lands on both sides of the Potomac, to the exclusive use, for manufacturing purposes, of the water of this river, the highway, but recently, of two sovereign States, be not sustained, the profit to be derived to the company, from the proposed

* "After the enlarged dimensions of sixty feet by six feet for the volume of water in the canal, were recommended to the Committee of the House of Representatives on Roads and Canals, by the chairman, he addressed a letter of inquiry to Gen. Bernard, on the comparative resistance of the motion of a boat of given structure and burthen on such a canal, and one of the dimensions recommended by the board over which that officer presided. The annexed letter contains his answer to this inquiry:

Letter from Gen. Bernard to Hon. C. F. Mercer.

WASHINGTON CITY, *February* 17, 1827.

"SIR: I have the honor to forward to you the result of the calculation you asked for, in relation to a canal 60 feet wide at the water line, 45 at the bottom, and 5 feet deep.

"The cross section of the boat remaining as assumed in the report on the Chesapeake and Ohio canal, such a boat would, for the reason set forth in this report, move, at moderate velocities, on 60 feet canal, as on an indefinite extent of water.

"The resistance proved, in this case, by the boat being expressed by 1, the number 1.21 will represent the relative resistance in a 48 feet canal, and 1.58 that in a 40 feet canal. Thus, with a towing power of 100 horses, the same work will be performed on the 60 feet canal as with 121 horses on the 48 feet canal, and 158 on the 40 feet canal—these two latter canals being here supposed to retain the respective cross sections assigned to them in the aforesaid report.

"Now, assigning to these two canals the same comparative length and amount of lockage as alluded to in the report, they become on the same footing as to towing power. But the 60 feet canal has the same length and amount of lockage as the 48 feet canal: therefore, it will have an advantage of 21, or 18 per cent. over the latter, as to towing power, and the same advantage over the 40 feet canal. In other words, 18 per cent. more weight would be transported during the same time, and with the same towing power, on the 60 feet canal, than on the two others.

I have the honor to be, sir, very respectfully, your obedient servant,

BERNARD, *Brig. Gen.*

To the Hon. C. F. MERCER, M. C., *Washington City.*

application of part of the water of the much enlarged canal, will amply repay the cost of its enlargement, while the public, as well as the stockholders, will be compensated for some delay in their ascent of this short portion of the canal, by the rapid growth of their common market. The company cannot be a loser, though the construction given by these claimants to the charter of the late Potomac Company be confirmed, by the judicial interpretation which they have sought of its true import, and of its subsequent modification by the charter of this company.

"Still, it remains, in the judgment of the board, a question to be determined hereafter, whether the enlargement of the dimensions of the canal, beyond fifty feet, shall be extended above the mouth of the Shenandoah, and through its ascent to Cumberland.

"As far, at least, as the former point, a prudent regard to the competition which this commercial avenue has to encounter, not only for the trade of the west, but of its own tributaries, the valleys of the Potomac, and of its navigable branches, required that the board should avail themselves of all the aid which science could supply to fix this commerce in its natural channel.

"The acquisition of at least sixty per cent. to the facility of transportation, upon the broader and deeper channel provided for the Chesapeake and Ohio canal, is believed to be worth more than an advance of twenty per cent. upon the cost of its construction.*

"In the same spirit which has given these enlarged dimensions to the plan of the canal, the board have diligently and laboriously sought, by negotiation and argument, as well as by appeals to legislative authority, to preserve the entire line of canal, above Georgetown, free from the dangerous, inconvenient, and costly obstruction of permanent bridges. They have invoked the interest as well as the patriotism of individuals, and the wisdom and policy of juries and legislatures. The appeal to the last has been in but one case availing; but they have been able to suspend the erection of any bridges for the present; and still seek, by the purchase of small tracts of land, lying between the canal and the river shore, to diminish the number of persons interested in opposing their wishes. Until a modification can be had of the charter of the company, conveyances for such parcels of land are proposed to be taken to trustees, for their future use.

"The entire quantity of land, from the District of Columbia to the Kitoctin mountain, lying between that required for the canal and the river, was long since found, by actual survey, not to exceed 1,300 acres, of which, more than 500 are reported to be inarable. This land is not in one body, but in narrow slips, the property of numerous proprietors; and the erection and maintenance of permanent bridges for the accommodation of each, would, apart from obstructing the navigation of the canal, cost more than the land itself is worth, at any fair estimate of its value. From the Monocacy to the Point of Rocks, along the far better part of this country, the quantity of land,

* "By an early order of the President and Directors, it was determined to verify, by experiment, the relative advantages afforded to navigation in boats of given dimensions, by large and small canals. For this purpose, troughs were made, each 30 feet in length, designed, by their relative capacity, to illustrate the proportions of the New York and Ohio canals to the Chesapeake and Ohio canal.

"Although the result of these experiments demonstrated the very great superiority of the larger over the smaller canal, so many defects were apparent in the manner of arriving at the results, that the board determined to ascertain, by the actual construction of a small part of the canal, the exact difference of the resistance offered to the passage of a boat of given dimensions and cargo, on these canals.

exclusive of the precipitous banks of the river, cut off from the main by the canal, does not comprehend fifty acres; for five miles, it does not exceed six acres; the canal having been generally, always where practicable, conducted along the margin of the river, as well to avoid these interruptions, as for the sake of better ground; and a more ready access to the canal itself from the opposite shore of Virginia. Although much more deeply interested in procuring a ready passage across the canal than her neighbor, whose territory it immediately borders, this State has readily assented, where the company may deem it expedient, to the substitution of ferries, for bridges over the canal. Between Harper's Ferry and Georgetown, but few public highways at all interfere with such a provision. One of these may be provided for by a very elevated bridge, another by a pivot bridge over a lock immediately crossing it; and, in some cases, ferries, attended with no danger and very little delay, may be resorted to, with the approbation of the local authority charged with this branch of the public police.

"Should the confident hope, inspired by intelligence recently received from the canals of Europe, as well as of the United States, be confirmed, and it be found practicable to substitute, on this canal, the application of steam for animal labor, as its propelling power, its enlarged and unobstructed surface will favor, alike, economy of transportation and the comfort of the traveller; and render that, which is obviously the shortest, also the cheapest and the most agreeable channel of intercourse between the Eastern and Western States. Boats of elevated cabins and double decks, propelled by steam, will countervail, by a velocity of seven or eight miles an hour, the transient suspension of their motion by the locks; and by supplying the wants of every description of passengers, will afford, at the same time, cheap accommodation to the needy, and multiplied enjoyments to the rich. By such means will this improved channel of internal commerce, national in its end, as it is, in part, in the resources provided for its accomplishment, confirm the union of the States, without an undue increase of the power of their common government. And if, in the prosecution of such an object, some expense may seem to have been encountered which parsimony might have denied, the patriotism from which this enterprise sprung, and on which it must continue to rest, will not, it is presumed, reject the powerful appeal which an enlarged economy in conducting such a work addresses to the Legislatures of the Federal Government, and of the States who share the cost of its prosecution with public spirited individuals. To these individuals themselves, the argument in favor of the plan adopted by the board is as simple as it is intelligible, that a more costly canal, with an active navigation, will yield a better dividend than one of cheaper dimensions without any commerce whatever."

(G.)

Extracts from the reports, by Messrs. Roberts and Cruger, of the examination, survey, and estimate of the western section of the Chesapeake and Ohio Canal, and from the first report of the United States' Engineers of the examination and location of that section, in 1824.

In Camp, Alleghany Mountain,
10*th May*, 1829.

Dear Sir: We reached the ground destined to be the seat of our first operations on the 2d instant, (Saturday) and commenced our levels on Monday; assuming low water mark at the mouth of Flaugherty creek to be 30 feet below our summit level, which level we met with after having proceeded up its valley 47 chains, where I made a permanent bench mark, which served as a base for our subsequent movements. Mr. Roberts not being present, nor having yet arrived, I conceived the only proper mode to obtain the object of our inquiry was, to run a line of levels on the two opposite sides of the mountain, and to make an accurate traverse of the whole. Under these impressions, I directed one party to carry a line, upon this level, down the valley of Casselman's river, to ascend all the valleys of the mountain as high as this level would lead. In prosecuting these instructions, in two miles they met with the valley of Blue Lick creek, which they ascended about 1½ miles from its mouth, before the level came in contact with the stream; they, in three miles further, met with the valley of Buffalo run, which they ascended about two miles, when the level was encountered by the stream. There were several small indentations in the side of the mountain, but these two are the most marked, and are the only ones that we can reasonably expect to assist the object of our research.

Another party I directed to carry the level across the mountain, (up the valley of Flaugherty creek) and pursue a similar examination on the eastern side. After this party had ascended the valley of Flaugherty creek a short distance, I directed them to pursue a course that carried them directly to Bowman's creek, where it forms its junction with Will's creek, and which had been designated as the eastern entrance to the tunnel. In the accomplishment of this duty, they ascertained that the water in the race of Bowman's sawmill was 18-100ths of a foot below bottom, and the summit of the ridge 875 feet above it. Length of the tunnel somewhat more than 4 miles.

I directed a third party to run up Casselman's river, to ascertain a point whence a feeder could be taken from that stream, and carry the level over the ground, with a view to the location of a feeder as they progressed. The result was, that the level struck the river a short distance below Forney's mill-dam.

In all these experimental surveys, I directed the assistants to make bench marks at every half mile, and mark the distance from the junction bench; and, in order that the line might be afterwards followed and examined, to cause the trees in line to be blazed. With regard to the party selected to cross the mountain, they were directed to make bench marks at every elevation of 100 feet.

The first party spoken of have accomplished the line of levels to Buffalo creek, (beyond which any further examination for a tunnel would be useless,) and are running a level from the valley of Blue Lick creek to the mouth of

Bowman's, to enable us to institute a comparison between the merits of the two routes. As the formation of the country developes itself to our understanding, we will be better able to determine what other points merit particular examination.

The elevation of the mountain at its summit, where we crossed it, is 875 feet above the level of the tunnel; whereas it is (per report of the U. S. engineers) 856, making a difference of 19 feet, supposing the two levels of the tunnel to be the same. The reason of this variation is accounted for, when I mention that the levels, as a matter of convenience to the officers of the United States, were carried over the mountain on the road leading to Cumberland, where the mountain has a depression of apparently that number of feet, but in a direction varying from the true course of the tunnel 35 or 40°. They obtained the true course and distance by calculation. The line run by us was made subservient to the double purpose of taking our level to the valley of Will's creek, and of exhibiting an accurate profile of the tunnel.

The second party spoken of are engaged in running the level on the eastern side of the mountain. The third party, which I entrusted to Mr. De Witt, I have dissolved, and taken its ingredients to strengthen the other two bodies, reserving some to make the protraction and maps of what has been done, and what is doing.

As to the opinion I have formed of the resources of water for the supply of the summit level, and six miles down on each side of it, it must necessarily be crude, and without any other data than the mere appearance of the streams and the natural situation of the country. As to Casselman's river, it is a fine stream, from 80 to 100 feet wide, 2 to 4 feet deep, running with a steady current of 2 to 3 miles per hour. Flaugherty is much less, but more equal in its discharge: at present it has enough for two sawmills and a gristmill, with two run of stones, which could be kept in constant operation. Blue Lick is about the same as this last; Buffalo run considerably larger. These three streams, taking their rise in the mountains, are supplied principally by springs, and are consequently not much affected by droughts. In addition to these, Elk Lick, flowing into Casselman's river between Flaugherty and Blue Lick creeks, but from the opposite side of the river, might either be carried into the reservoir at Forney's mill, or directly into the canal, by an aqueduct across Casselman. These four streams have not been enumerated in the report of the United States' engineers, nor have they alluded to the extensive reservoirs that can be formed upon them, particularly on Flaugherty. But these are subjects of after consideration, and are merely mentioned to support the opinion I entertain, that there is an abundance of water, if all available means of supply are resorted to, of running water and reservoirs. As to reservoirs, the country strikes me as being peculiarly adapted to their formation. Should these resources, in the course of many years, prove insufficient, let the age when this occurs avail itself of the waters of Deep creek, which can be made to contribute, but which, at present, are not required. The expense of their introduction ought not for a moment impede the progress of a work so important in the results to be derived from it, as the one now under consideration. But I have full confidence that it can be dispensed with for many years, if ever required.

The climate, I think, is remarkably humid, and that opinion is farther strengthened by the luxuriant growth of the moss, which covers even the

fencing on the high grounds. The situation of the country renders showers and falls of rain very common in the summer season, which would all be caught and retained in the reservoirs.

ALFRED CRUGER.

BENJ. WRIGHT, Esq.
Chief Engineer, Ches. and Ohio Canal.

Western Section of the Chesapeake and Ohio Canal Tunnel Line.

BROTHER'S VALLEY TOWNSHIP,
Somerset County, Pennsylvania.

In pursuance of instructions, I beg leave to make the following communications, through the Engineer in Chief, to the President and Directors of the Chesapeake and Ohio Canal Company.

The party of engineers appointed to this service, commenced operations the 4th of the present month, (May) at the western end of the tunnel or summit line, on Flaugherty creek, at a bench mark (as near as could be ascertained) placed by Capt. McNeill, of the United States' topographical engineers. This level was carried up the valley of Casselman's river, to a point opposite Forney's mills, six miles and six chains, to ascertain the line of the feeder; which may be reduced in length to about four miles. This line is mostly over improved bottom and sloping land, quite feasible in quality.

A second party carried the same level down the valley of Casselman, following up the valley of Blue Lick creek, and other streams and indentations of the hills, to a point some distance up the valley of Buffalo creek, in order to ascertain the comparative practicability of different routes for the tunnel line across the Alleghany ridge to Will's creek: and, at the same time, a third party commenced at the proposed mouth of the tunnel on Flaugherty, and carried the line across the Alleghany ridge to the valley of Will's creek, near the mouth of Bowman's run—the same route which was run by the United States' engineers. This line of tunnel was found to be four miles long, with a short distance of deep cutting at each end; and the greatest elevation of the ridge was found to be 876 feet above the bottom of the tunnel.

These lines being accurately surveyed and protracted, it appeared from the map that a tunnel line from the valley of Blue Lick creek, across the ridge, to Bowman's or Will's creek, would be at least as favorable as the line up Flaugherty; and, as the western end of this line was about three and a half miles further down on Casselman, about that distance of canal would be saved, and the line be made more at right angles across the main ridge. With these impressions this line was run, and the length of tunnel was found to be 3 miles 4,752 feet, and the greatest elevation of the ridge 955 feet. But the whole amount of elevation on this line is ascertained to be considerably less than on the Flaugherty line. To demonstrate this, a profile of the ridge over each tunnel line has been drawn, and divided into spaces for shafts, 220 yds. apart, or 8 shafts to a mile. From this it appears that the length of the shafts on the Flaugherty line amounts to 13,877 feet, and the length of the shafts on the Blue Lick line amounts to 13,081 feet, making 796 feet of

shafts in favor of the Blue Lick line. But, as the levels were going on, it is proper to observe, that the level of the tunnel penetrated some distance up the valley of Buffalo creek; and, observing the favorable direction of the line, and the depression of the ridges in the direction from Buffalo towards Will's creek, or the valley of Brush run, a branch of Will's creek that comes in from the northwest, below Bowman's. With these impressions, the summit level was extended from Bowman's, six miles, to the valley of Brush creek; but those routes being protracted, were found to be more than six miles long, and were therefore abandoned.

The Alleghany ridge, through which the proposed tunnel is to pass, is generally covered with a good growth of different kinds of timber: the oak and chesnut predominate; black cherry, poplar, and pine, abound in some places. The soil is sandy loam or clay, in some parts of a red color; considerable quantities of loose stone, of the sandstone or freestone kind, abound on the surface; in a few places the sand rock appears in ledges and cliffs. The interior of the mountain, from all appearacnes, is soft sand rock. And as bituminous coal is found in many places in this vicinity, the various depths of the shafts would probably pass through many veins of that valuable mineral. The streams of water are very pure, and the climate remarkably healthful; the country is well cultivated and productive in the valleys, and on the sides, and in many places on the tops, of the lower mountains.

A map of the country thus explored, and a profile of the tunnels, with the depth or length of the shafts, are herewith presented. And, as no other route appears so practicable, in this direction, as those above mentioned, I have, for reasons above stated, made choice of the Blue Lick line. And, from the view I have taken of the streams of water, and the surface of the country from which they are to receive their supply, and having carefully examined the reports of the United States' engineers on that subject, and compared those calculations with present appearances, I am fully of opinion that the supply of water for this summit, on the present level, and for eight or ten miles at each end, will be amply sufficient.

But an important view of this subject will be seen by observing the profile of the Blue Lick route: that, if the summit level could be raised and supplied with water at an elevation of 250 feet above the present summit level, the length of the tunnel might be reduced to less than two miles, but the supply of water in that case might be rendered extremely doubtful. At this season of the year, it would not afford much satisfaction to gauge the streams. An opinion, therefore, is all that is submitted at this time.

Being satisfied there would be a sufficient supply of water on the present level, I have deferred, for the present, the examinations for a railroad, and shall comply with those parts of my instructions which require the canal to be located from the east end of the tunnel to Cumberland, and from the west end of the tunnel to the mouth of Casselman, or to Turkeyfoot. These surveys are already commenced, and will be continued with all reasonable despatch. Mr. Cruger will proceed with a party down Casselman, and I shall proceed with a party down Will's creek, and shall occasionally be with each party.

With respect to the estimates of expense of constructing the tunnel, it will require great deliberation and reflection to fix the size and dimensions of the tunnel, towingpath, shafts, headings, drains, &c. which I should choose to submit for further consideration.

The estimates of the canals to be located, together with the locks, aqueducts, culverts, and waste weirs, &c. will be made according to my instructions; although it may be doubtful whether the locations and estimates can be completed from Cumberland to Turkeyfoot much before the first of July.

Any further communications from the board, or from the engineer in chief, will be most conveniently received at the post office in Cumberland.

All which is respectfully submitted.

NATHAN S. ROBERTS,

Civil Engineer, and member of the Board of Engineers of the Ches. and O. Canal Comp'y.

May 16, 1829.

Camp, 14 miles down Will's Creek, Southampton township, Somerset county, Penn. 31st May, 1829.

To the Engineer in Chief of the Chesapeake and Ohio canal, and through him to the President and Directors of said company, the following communications and statements are respectfully submitted:

Since my communication, dated the 16th instant, the location of the Chesapeake and Ohio canal has been progressing as therein mentioned.

On Will's creek, fourteen miles have been located; but, although the greatest diligence has been used by the party, little more than one mile a day has been accomplished: this brings the location within two miles of Little Will's creek. The fall in this distance has been very great, and nearly uniform. The general direction of Will's creek is east, in its passage from Bowman's, and is nearly at right angles from the Alleghany, and across the other great ranges of mountains, through which nature has formed its channel, for about sixteen miles, to the pleasant valley of Little Will's creek. The whole of the above distance, except in two places, making together about one mile, is a continued forest of various kinds of valuable timber, intermixed with a thick growth of laurel, which is the most tedious of all shrubbery to run a line through. The table lands and glades adjacent, in some directions, are well cultivated old settlements. The ground to be occupied for making the canal is on the narrow bottom in the valley of Will's creek, and along the foot of variously uneven slopes of the hills; the soil is in general very good, though a considerable mixture of loose stone, and, in some instances, rock, is to be met with; a considerable amount of walling, in places, especially towards the lower end, will be necessary. But what renders this distance so peculiarly expensive, is the great amount of lockage; we have, in 14 miles, 860 feet of lockage, and expect 150 feet more in the remaining two miles, to the junction with Little Will's creek.

In the distribution of locks, I have thought proper to locate the first 140 feet in locks of five feet lift, in order to reduce the necessary draft of water through the tunnel; after leaving the tunnel basin, the canal and locks occupy the valley, and command, at short distances, the water, which accumulates very fast in the channel of Will's creek, (a small mill stream at Bowman's.) In about two and a half miles, the accumulation of water was judged sufficient to increase the lift of the locks to 8 feet, which was continued.

Although the valley of Will's creek is narrow, (from 10 to 40 perches) yet its course is composed of a variety of easy curves through the mountains;

but the stream of Will's creek meanders over the valley from side to side; and, in locating the line of the canal, the stream has been crossed a number of times, to give a better direction to the canal, and for the greater economy of water. By thus taking in the creek as a feeder, the leakage from the canal and the springs from the hills, which are constantly accumulating, are collected in the channel of the creek, and returned to the canal at short distances, to supply the leakage and evaporation, which are nearly the whole expenditure, as the leakage and soakage are nearly all returned to the canal at each dam. And the surplus, being passed over a suitable waste, into the natural channel of the creek, is, with its accumulation, again taken for the use of the canal, at the next dam.

As there are so many locks as to render it expensive to convey the feeding water safely around each, the natural channel is made to answer this purpose, and to return the necessary supply, to the canal, at convenient distances.

Besides, the direction of the canal is much improved, being straighter, and placed on ground where it is much easier made, than if it occupied the bed of the stream, (which it must do if the line did not cross it) at the foot of Steep Hills, where the embankment must be secured, by slope walls more or less extensive, against the violence of the stream, which must be forced into a new channel, along the outside of the banks. In one or two instances, the channel of the creek may be used for the canal for short distances; but it is generally passed directly over a stone dam, with a suitable waste-weir. Will's creek, at this season, is a handsome sized mill stream, and Little Will's creek adds about one fourth to its size: although they both diminish considerably during a long drought, yet I am of opinion that a canal, with its fixtures, well constructed on the above arrangement, would always have a competent supply of water.

The average cost, as estimated, will amount to about $80,000 per mile, as far as the location extends, and to the junction of Little Will's creek.

From the junction of Will's creek and Little Will's creek, (in the pleasant valley formed between the Will's mountain on the east, and Little Alleghany on the west) the distance to Cumberland is about 14 miles; the sides of the hills abound with lime stone, sand stone, and stone coal, in places, and most of the bottom land is cultivated. Through this distance, the canal can be constructed at less than half the expense of the part above the junction, as the lockage is only about one third as great, and the other difficulties proportionably less.

If we have suitable weather, I am of opinion we shall arrive at the bench mark made by Geddes and Roberts, below Cumberland, in about ten days.

All which is respectfully submitted.

NATHAN S. ROBERTS,

Engineer, and member of the Board of Engineers of the Ches. and O. Canal.

Five miles below Connellsville, on the right bank of the Youghiogany river,
CAMP, EAST LIBERTY, 23d JUNE, 1829,
Fayette county, Penn.

To the Engineer in Chief of the Chesapeake and Ohio Canal:

SIR: After separating into two parties on the summit, the charge of the western location, to Turkeyfoot, was committed to Mr. Alfred Cruger, assistant engineer, appointed by the board. The situation of the two divisions from each other, and the necessary attention to that under my more immediate care, (the Will's creek division) made it inconvenient for me to attend on the western or Casselman division, except a few miles at each end; but, having attentively examined the estimates, and a part of the location, am of opinion the same are correct and judicious. I would remark, with regard to the location of a dam about 300 yards below Turkeyfoot, or the junction of Casselman, the Youghiogany, and the north branch or Laurel run, that a spacious and highly useful basin would be formed in the mouths of those streams, which would flow up the Youghiogany nearly one mile, in a direction towards Smithfield, situated about three miles south on the national road. This would greatly accommodate that town and the surrounding country, by affording a constant supply of surplus water for various mechanical operations. The canal might be connected with the basin, by locking into the mouth of Laurel run, or by an aqueduct over said river, and about 30 chains of canal, and communicate with said basin by a guard lock, as reported, &c. This dam would be about 8 feet high and 400 feet long.

Respectfully submitted.

NATHAN S. ROBERTS,
Member of the Board of Engineers, Chesapeake and Ohio Canal.

SIR: I would further observe, that the parties are now on the remainder of the western section, and will this day commence the location. The party with Mr. Cruger will commence at Connellsville, and the other at Sewickly creek, about twenty-eight miles below. The maps of the Will's creek division are left in care of Mr. Shriver, at Cumberland, and will be soon forwarded by him to the board, or at farthest, by Mr. A. Stewart, who will probably attend the next meeting of the board. The maps and profiles of the Casselman survey will probably be sent by the same conveyance.

Yours, respectfully,
NATHAN S. ROBERTS, *Engineer, &c.*

The ENGINEER IN CHIEF, &c. &c.

Remarks upon the termination of the Canal at Pittsburg, Aug. 10, 1829.

To the President of the Board of Directors of the Ches. and Ohio Canal Comp'y:

SIR: Having completed the location of the western section of the Chesapeake and Ohio canal, by connecting it with the tunnel level of the Pennsylvania canal in the city of Pittsburg, agreeably to my letter of instructions, yet, for reasons respecting the economy of said termination, I take the liberty to offer a few of my own observations thereon for consideration.

It will be noticed in the estimates, that, from the Two Mile run to the proposed termination, the construction of the canal will be extremely difficult and expensive, as the canal, for the whole distance, will have to be made along the face of a very steep side hill, principally composed of clay of the same character of those hills up the Alleghany river, which have so often slipped and filled up the Pennsylvania canal, both while it was constructing and since it has been completed. And to these considerations of expense must be added the probably large amount of private damages to be appraised to individuals for the number of buildings to be moved, and the expense of opening new streets and roads, and for the damages done to gardens and lots of ground necessary to be occupied by the canal in approaching the present termination, (as above mentioned,) in order to descend through their locks into the Monongahela or the Ohio river. The lockage to be saved by this connexion is thirty-seven feet, divided into four locks, which are nearly completed; and I take the liberty to notice that the locks on that canal are but ninety feet in the chamber, being ten feet shorter than those on the Chesapeake and Ohio canal.

Should the above location and termination of the canal be ascertained to be unusually expensive and inconvenient, for the reasons above stated, the same can be avoided by shortening the canal about one and three quarter miles, and locking into the Monongahela above this clay bank, just below the mouth of the Two Mile run, where a very favorable situation for all the purposes, presents for the termination of the canal.

By this termination, not only the above expense will be avoided, but an improved location of the canal and locks can be made, by commencing about three miles up the river, at the lower end of the Scotch Bottoms, whereby a great saving will be made, in crossing the Four Mile run, and by leaving the public road undisturbed, and saving much expense in steep side hill cutting and deep embankments: for the line of the canal thus revised would run below the road, and along the bottoms, quite to the proposed place of termination at the Two Mile run.

I am fully of opinion, that, by this arrangement, a saving would be made in the expense of constructing *these three miles* of canal, sufficient to construct thirty-seven feet of lockage saved on the first termination, anew, and of the same length of those required and now building on the Chesapeake and Ohio canal, and in favor of terminating at the Two Mile run, if it should be thought in other respects expedient. It is proper to observe, that the Monongahela river, from thence to Pittsburg, is a most beautiful sheet of water, with but very little fall or current, which is scarcely perceptible. Its width, at low water, is about fourteen hundred feet, and its depth, at the same time, from six to eight feet; its rise in time of floods is from fifteen to thirty feet; but, being confined between high banks on each side, its width in time of floods, is not materially increased, as below the Two Mile run it seldom rises to the top of its banks. From the city up to the Two Mile run, is considered as the suburbs, which along the river is much occupied by manufactories of different kinds; and above the steep bank the ground is highly improved, as gardens, orchards, meadows, &c. interspersed with numerous buildings, many of which are tasteful and elegant. On the opposite side of the Monongahela is situated the manufacturing town of Birmingham; and many other large manufacturing establishments are seen further down the river. All these places are accommodated by steamboats in their season,

and all other river craft; and from the information obtained, and my own observation, the great natural harbor for steamboats in the Monongahela extends quite up to the Two Mile run, and is, in all respects, as capable of improvements as that part of the river which they now occupy before the city of Pittsburg.

All which is very respectfully submitted.

NATHAN S. ROBERTS,
Civil Engineer, &c.

GEORGETOWN, *Sept.* 2, 1829.

To the President of the Board of Directors of the Ches. and O. Canal Comp'y:

SIR: The summit level of the Chesapeake and Ohio canal, embracing the tunnel through the Alleghany ridge, the deep cuttings, and the basins at each end, and the feeder from the Casselman river, are the subjects of this communication.

All which is respectfully submitted.

NATHAN S. ROBERTS,
Engineer of the second division C. and O. Canal.

The Alleghany ridge, through which the tunnel is to be cut, is supposed to be sandstone, with a mixture of slate: this opinion being formed from the quality of the rocks which appear on the surface, and in cliffs in the sides of the mountain at various heights. And, in corroboration of this opinion, it is proper to state, that the same qualities of stone present themselves both above and below the level of the tunnel, along the line of the canal, in detached boulders and large masses, variously disposed in the bed and on the margin of the rivers, and in the *debris* or fine broken stone, which in many places cover the steep sides of the mountain; and, proceeding west, the regular layers and horizontal cliffs and ledges of sandstone appear in all the steep hills and mountains through which the channel seems to have been worn down by the Casselman and the Youghiogany, till they have united and passed through Laurel hill. And the same quality of sandstone, with veins of slate, appears in horizontal strata above the coal veins, in the high hills in the vicinity of the Monongahela and Pittsburg, and in the coal district near Cumberland. Frostburg and Westernport sandstone is found in the same situations. In a few places these stone are of the millstone grit, and wrought for that purpose. This was observed on the national road, and about twelve miles down the valley of Will's creek; but; in general, they are a soft sandstone, suitable for locks and all other purposes where cut stone work is necessary.

The elevation of the tunnel or summit level is 1972 feet above low tides at Georgetown, and 1273 feet above low water in the Ohio at Pittsburg; and the difference shows that the Ohio river at low water at Pittsburg is 699 feet above common low tides at Georgetown.

The length of the summit level consists of the tunnel of 4 miles, to be excavated through the Alleghany ridge, and, at each end of the tunnel, a deep cut and a basin are extended, and terminated by a lock.

The length of the deep cutting and the basin at the eastern end is 40 chains, and the length of the deep cutting and basin at the west end is 1 mile, making the whole length of the summit level, from lock to lock, 5 miles and 40 chains.

The dimensions of a transverse section of the interior of the tunnel, and upon which the following calculations are presented, are shown in the annexed diagram, and are as follows, viz:

The water for the passage of boats through said tunnel is to be 6 feet deep and 17 feet wide. The towing path to be 7 feet high (rising one foot above water) and 5 feet wide. The width of the tunnel above the towing path will be 22 feet, and the height 7 feet to the spring of the arch, which is supposed to be equal to a semicirle of 11 feet radius. On each side of the bottom of the tunnel, a drain is to be sunk in the rock, below the bottom of the canal, equal to a cut of two feet square, with a descent of 3 feet in the distance from the centre to each end of the tunnel. A section of the tunnel, according to these dimensions, is equal to 52⅓ superficial yards; and the solid contents, in 4 miles, will be equal to 368,428 cubic yards.

In the prosecution of this work, it is calculated that 120 men, divided into relays of 30 men each, may be advantageously employed at blasting and quarrying at each end of the tunnel: one company to perform 12 hours, and then be relieved by another company, to labor for an equal length of time, and thus proceed through the 24 hours, making, in the result, a force equal to 120 men laboring for 12 hours in each day. And it is computed that, taking a portion of the heading, the side trimmings, and the drain, together with the blasting and quarrying from the breast or body of the tunnel, a good hand will not average less than ¾ of a cubic yard for each day's work. At this rate, 120 men will blast and quarry 90 cubic yards per day.

The tunnel, as above stated, contains 368,428 cubic yards; this quantity, divided by the amount of one day's work, gives 4,094 days, and, allowing 300 days for labor in each year, the time required to complete the excavation of the tunnel will be 13 years and 194 days.

The wages, subsistence, and apparatus, furnished and kept in repair, for each man per day, for blasting and quarrying in the tunnel, is computed, as follows:

Wages per day, on an average - - - -	- $1 00
Board and other necessaries of subsistence per day	- - 50
Gunpowder, all necessary tools, and light, per day	- - 75
Making the average expense of a day's work of one man	- $2 25

Then, a day's work of 120 men, at the above rate, will be $270; and the amount of rock quarried, in the same time, being 90 cubic yards, the average cost will be $3 per cubic yard.

The expense of transporting the excavated materials out of the tunnel, is computed as follows: A railroad with two sets of tracks is to be laid on and bolted to the bottom of the tunnel, as the work progresses, and to extend past the deep cutting and basin at each end of the tunnel, for the purpose of conveying the materials to a place of deposit and distribution. The expense of a double railroad, equal to the whole length of the tunnel, and half a mile at each end, for the above purposes, is estimated as follows, viz:

5 miles of double tracks will require 105,600 feet of timber, 8 by 12 inches square, and from 20 to 40 feet long, for side rails, delivered at 8 cents per foot - - - - - -	$8,448
10,560 inch bolts, 16 inches long, equal to 23 tons, at 150 dollars	3,450
105,600 feet of rolled iron plates, 1¾ inches wide and ⅜ths of an inch thick, equal to 106 tons, at $130 per ton - -	13,780
1 ton of spikes - - - - - - - -	200
Fitting down and bolting the side rails to the rock, and spiking on the plates on the inner edge of each set of tracks, in a workmanlike manner, and completing the same fit for use, (the bolts being ready made, and the plates punched at the above prices) 6,400 rods of the road, laid as above stated, at 50 cents a rod - - - - - - - -	3,200
Making the whole expense of the railroad - -	$29,070

The materials excavated from the tunnel are to be transported on this railroad, being laid for the purpose, from each end towards the centre, as the excavation of the tunnel progresses.

The load which a horse will draw on such a railroad, and moving at the rate of 2½ miles per hour, is stated variously by different authors, and varies from 8 to 11 tons. But, in these calculations, 1 ton only is estimated for each load, on an average, to be drawn by one horse. The day's work of a man and team is computed at ten hours each day, moving at the rate of 2½ miles per hour, including the time of loading and unloading—making 25 miles for every period of 12 hours.

The cost of a day's work of a man and team is estimated at -	$2 00
One assistant loader to each wagon, to have the loads ready, &c.	1 00
Making the cost of 1 team and 1 loader, per day, equal to -	$3 00

Supposing the materials to be taken from the tunnel to be sand rock and slate, the comparative weight or specific gravity of which is estimated at 2.8, then the weight of the contents of the tunnel to be transported, will be equal to 388,576 tons, to be taken out at each end of the tunnel, at 1 ton per load, or 777,152 tons in the whole 4 miles.

The distance to be travelled out and in at each end of the tunnel is thus stated: at the commencement the distance would be, on an average, 40 chains out and 40 chains back, and, at the centre of the tunnel, the distance would be 2 miles and 40 chains out, and the same distance back, and the number of times the average of these distances is to be travelled, is equal to the number of tons to be taken out at each end of the tunnel—thus stated: $\frac{40+40+200+200}{2} \times 388,576 \div 80 = 1,165.720$ miles to be travelled out and in, from each end of the tunnel. This sum, divided by 25, the estimated length of a day's travel, gives 46.629.12 days' travel for one team at each end of the tunnel. But the transportation is to be done in the same time with the excavation; then, $\frac{46.629.12 \times 2}{4.094} = 22.8$ teams per day, in the whole, or 11.4 teams per day at each end of the tunnel, to keep even with the excavation.

As the height of the mountain over the line of the tunnel would render vertical shafts very expensive, it is proposed that, when the excavation of the tunnel has advanced about a half a mile at each end, or perhaps sooner, to ventilate the tunnel by means of a steam engine of about ten horse power, to be stationed one at each end of the tunnel, with the necessary apparatus, to operate upon one or more cast iron blast cylinders, to be attached to a wooden trunk of the capacity of one foot square, made of two-inch plank, well matched, pitched, and banded with iron, so as to be perfectly air tight, and properly placed and secured on the towing-path of the tunnel, and to be extended by additions, from time to time, as may be required. Through this tube a sufficient quantity of air is to be forced, by the above apparatus, to ventilate the tunnel to its centre.

By a statement received from Mr. John Anthers, steam engine manufacturer at Pittsburg, the cost of a first rate steam engine at that place, of 10 horse power, is		$1,200
One large air cylinder and apparatus		500
Transporting the same to the tunnel, and putting the whole in good order fit for use		300
A wooden trunk of the description above stated, and being extended by degrees to the centre of the tunnel, 10,560 feet, at 50 cents a foot		5,280
The expense of fuel, Mr. Anthers states, for 24 hours, is "25 bushels of coal," estimated at 8 cents, or "2 cords of good wood," estimated at $1,	$2 00	
Cost of attendant and keeping in repair	2 50	
Making the whole cost for 24 hours	$4 50	
This expense would be necessary about 10 years, then 10+300= 3,000 days, at $4 50 per day		13.500
Add for contingencies, 20 per cent.		4,220
Making the whose cost of ventilating one end of the tunnel, for the required time, amount to		$25,000

Mr. Anthers states further, that such an engine, with but very little repairing, will last 10 years in constant use.

It is proper to observe that bituminous coal, of the best quality, can be obtained within 5 or 6 miles of the west end of the tunnel, and that timber for fuel abounds more at the east end, where coal is not to be expected so cheap; but perhaps it can be obtained at the above estimated price, or found in excavating the tunnel.

Whether the tunnel, or any part of the interior, will require a lining of masonry, is uncertain. If the excavation should be sound rock in regular strata, no lining will be necessary, except perhaps at the ends, to give a finish, and prevent the earth from falling into the mouth of the tunnel. The cost of lining, more or less, is not included; and it is proper to observe, that, where a lining becomes necessary, the section of excavation should be so enlarged as to preserve the same dimensions within the lining as are herein expressed.

From the foregoing calculation and analysis of prices, the estimated cost of the tunnel will stand as follows, viz:

Excavating 368,428 cubic yards of rock, at $3 - -	$1,105,284
Railroad, with double tracks, 5 miles - - -	29,070
Transporting the contents of the tunnel, viz: 22.8 teams, with one teamster and one loader to each team, for 4,094 days, making 93,343 days, at $3 - - - - - -	280,029
Ventilating the tunnel, viz: 2 steam engines of 10 horse power, one at each end of the tunnel, with the necessary apparatus for ventilating, including the expense of fuel, attendant, and repairs, for 10 years, at $25,000 each - - -	50,000
Add for contingencies 10 per cent. - - - -	146,438
Making the estimated cost of excavation, transportation, and ventilating the tunnel, amount to - - -	$1,610,821

Which is equal to $\frac{\$1,610,821}{yds.\ 368,428}$ or $4 37 $\frac{3}{10}$ per cubic yard for the whole quantity of materials required to be taken out of the tunnel, according to the dimensions above stated.

The deep cutting and basin at the east end of the tunnel, is 40 chains in length; the expense of constructing the same is as follows, viz:

Grubbing and cleaning for canal and basin - - -	$1,000
Common excavation, 44,600 yds. as 20 cts., to be laid in the lining for the basin - - - - - -	8,920
Rock excavation, 15,800 yds. at $1 - - - -	15,800
	25,720
Add for contingencies 10 per cent. - - - -	2,572
	$28,292

The deep cutting and basin at the west end of the tunnel, occupy 1 mile: the expense of constructing the same is as follows:

Grubbing and clearing, preparatory - - - -	$500
Common excavation, 56,320 yds., at 20 cts., to be laid in embankment to form the basin - - - - -	11,264
Common excavation 74,800 cubic yds., at 15 cts. - -	11,220
Rock excavation, 44,000 cubic yds., at $1 - - -	44,000
	66,984
Add for contingencies 10 per cent. - - - -	6,698
	$73,682

The dimensions of the deep cuttings for the canal from each end of the tunnel, are 30 feet at bottom of the canal, and the sides perpendicular through the rock cutting, with the usual slope of 3 to 2 given to the earth excavation. The basins will be formed by occupying the valley at each end of the tunnel, where the same is below bottom, for depositing the materials taken from the tunnel in the form of an embankment; and lining the same with the excavated earth, to render the banks and bottom of each impervious to wa-

ter. Each basin is to be formed with a waste-wier and a lock at the extremity. The distance between these locks is 5 miles and 40 chains, including the basins, the deep cutting, and the tunnel, which compose the length of the summit level."—*Rep. of Roberts and Cruger.*

In the able report of the United States' engineers, on the plan and cost of constructing the contemplated tunnel through the Alleghany, they proposed to expedite the progress of the work, and to cheapen its expense, by sinking over the tunnel forty-eight working shafts. By each of these, two additional surfaces to operate upon, would be presented to the laborers engaged in the tunnel, who work day and night without any interruption, except while elevating them to the surface of the mountain and letting them down, to renew their operations at regular intervals. These would, of course, be so ordered, as to allow ample time for refreshment and recreation to the laborer.

A steam engine of ten horse power, costing about $1,200, and placed near the summit of each working shaft, would raise, and transport out of the way, the excavated materials, whether of rock or earth, as fast as the laborers could remove them, within the tunnel, to the bottom of the shaft.

As to the mode of elevating these materials, none would, perhaps, better answer, than an application of the principle, by which the wheat is elevated in a manufacturing flour mill. The empty buckets, on one side of an endless chain of large square links, would balance those on the opposite side, at every stage of the revolution of the drum or cylinder, over which the chain revolves; so that the weight to be elevated would be that only of the excavated materials from within the tunnel.

The cost of all the working shafts recommended by the United States' Board of Internal Improvement, is less than three hundred thousand dollars. If reduced in number, to four only, for each mile, their cost would be reduced in like proportion, so as not to exceed one hundred thousand dollars; while the opportunity, thus afforded, of applying sixteen times the number of hands, which could be worked on the two extremes of the tunnel, would proportionably expedite its completion. Instead, therefore, of consuming thirteen years, with such facilities, the same work would be accomplished in less than a fourth of that period.

Tunnels on railroads, as well as canals, are now so numerous in England, that estimates can be as accurately formed of the money and time required for their construction, as for any other part of a railroad or canal.

On the canals, alone, of that country, there were, in 1824, near forty tunnels, varying in breadth from nine to twenty-one feet; in length, from seventy to 4, 840 yards; their aggregate extent being 62,291 yards exclusive of those numerous subterranean canals for coal boats; of which, on a single canal of the Duke of Bridgewater, there are branches of the extent of eighteen miles on various levels; some sixty yards below the main canal; others thirty-five and a half above it; the greater part of them all being hewed out of solid rocks.

The driving of the tunnel through Harecastle hill, on the Trent and Mersey canal, the first canal tunnel constructed in England, cost, in 1776, £3 10*s*. 6*d*. sterling, per yard run. On this single canal, in length 93 miles, with a lockage of 642 feet, there are as many as five tunnels, one mile of the longest of them, which is 2,888 yards in extent, was completed in a single year, though the natural surface of the earth was 210 feet above the tunnel.

Messrs. Roberts and Cruger estimate the entire cost of the proposed tunnel through the Alleghany, at 1,610,821 dollars. To reach this sum, they compute the wages and board of the hands engaged in the excavation, at $1 50 cts. each per day, after allowing 75 cts. more for his gunpowder, tools, and light: the price of a cart, horse, driver, and assistant, working on a railway, and drawing less than half a cubic yard of the excavated materials at a load, at $3 a day. It is not hazarding much to pronounce these allowances at least one-third too high. Carts are never hired on the Chesapeake and Ohio canal, at more than $1 25 cts. per day, the driver being himself found, but finding his own horse; and 80 cents per day is believed to be an adequate allowance for the wages of each hand, including his board. The subterranean character of the work would prevent the reduction of the working days of the month, by changes of weather, and still farther cheapen the operation. Still, as the breadth calculated for the tunnel, in this estimate is about, 17 feet less than the greatest utility of the work would require, after deducting the third of the computed cost of the excavation and transportation of materials, or 450,000 dollars for the above reason, and the cost of ventilating the tunnel, in consequence of the introduction of the perpendicular working shafts over it; being, in all, half a million of dollars, so as to reduce the cost of the tunnel described by the above engineers, exclusive of contingencies, to less than one million; the residue may be doubled on account of its increased breadth, and the sinking of the shafts; and the cost of the tunnel put down at 2,200,000 dollars, including all contingencies.

The ratio of the solid contents of the enlarged to, the solid contents of the smaller tunnel, it is admitted, would not be in the direct proportion of their relative breadth; but the increased facility of working in an enlarged space, and the reduction of the cost of transportation, effected by the application of the working shafts, would make this estimate sufficiently great to cover the total expense of a tunnel, within which, the canal boats might readily pass each other in opposite directions.

This estimate supposes the tunnel to be conducted through solid rock; and an inner arch of brick or stone to sustain the crown of it, to be unnecessary. Should its passage be through earth, requiring artificial support, the cost of this should be added, but the expense of excavation be reduced, since this necessity supposes the excavation not to be of rock.

SUMMARY

FROM THE

REPORT OF MESSRS. ROBERTS AND CRUGER,

OF THE

SEVERAL SUBDIVISIONS OF THE WESTERN SECTION OF THE CHESAPEAKE AND OHIO CANAL,

EXTENDING FROM

CUMBERLAND, MARYLAND, TO PITTSBURG, PENNSYLVANIA.

SUMMARY from the Report of Messrs. Roberts and Cruger, of the Canal, extending from Cumberland,

	Number of Sub-division.	Length.		Grubbing, &c.	Excavation.	
		Miles.	Chs.	Cost.	Cubic yds.	Cost.
First division. Extending from Cumberland to Turkey-foot.	Summit Level, - -	5	40	$ 4,556	848,048	$1,731,787 50
	No. 1, East, - - From tunnel basin to Little Will's creek.	15	60	11,100	526,799	74,447 37
	No. 2, East, - - From Little Will's creek to Cumberland.	15	7	4,485	406,753	45,976 17
	No. 1, West, - - From the west end of tunnel basin to Middle Fork creek.	14	40	9,141	246,451	38,619 95
	No. 2, West, - - From Middle Fork creek to Turkey-foot.	17	3	10,208	362,820	52,646 97
		67	70	39,490	2,390,871	$1,943,477 96
Second division. Extending from Turkeyfoot to Pittsburg.	No. 3, West, - - From Turkey-foot to Connellsville.	27	00	15,540	1,228,101	269,336 61
	No. 4, West, - - From Connellsville to Sewickly creek.	27	6	11,270	556,243	67,020 97
	No. 5, West, - - From Sewickly creek to McKeesport.	16	52	7,124	488,685	53,245 29
	No. 6, West, - - From McKeesport to Pittsburg.	14	79	9,599	903,968	116,993 48
		85	57	$43,533	3,176,997	$506,596 35

RECAPITULATION OF

First Division, - - - Extending from Cumberland to Turkeyfoot, being that part of the line denominated by the U. S. Board of Internal Improvement "the middle section."	67	70	39,490	2,390,871	1,943,477 96
Second Division, - - - Extending from Turkeyfoot to Pittsburg, denominated by the United States Board of Internal Improvement "the western section."	85	57	43,533	3,176,997	506,596 35
Totals, -	153	47	$83,023	5,567,868	$2,450,074 31

several subdivisions of the western section of the Chesapeake and Ohio Maryland, to Pittsburg, Pennsylvania.

Embankment.		Slopewalls.		Culverts.		Aqueducts.		Dams and feeders.	
Cubic yds.	Cost.	Perches.	Cost.	No.	Cost.	No.	Cost.	No.	Cost.
169,280	$11,064 00	11,064	$11,064 00	9	$2,950	-		2	$56,200
288,902	55,695 16	35,412	31,236 00		-		-	23	16,750
288,128	44,341 21	13,794	12,899 00	10	3,400		-	6	20,775
579,757	83,614 11	48,237	47,908 60	14	7,035	1	$6,500	3	4,825
539,355	87,862 91	41,749	40,282 65	9	3,500	1	12,900	2	13,077
1,865,422	282,577 39	150,256	143,390 25	42	16,885	2	19,400	36	111,627
727,702	152,864 56	88,768	69,057 50	15	4,900	1	10,000	2	4,760
1,703,616	312,380 48	134,358	137,311 50	56	21,567	1	17,014	2	21,800
1,176,980	232,185 97	55,707.6	60,947 85	49	19,114				
838,659	126,459 35	-	-	28	22,306				
4,443,957	$823,891 36	278,833.6	$267,316 85	148	$67,887	2	$17,014	4	$26,560

THE WESTERN SECTION.

1,865,422	282,577 39	150,256	143,390 25	42	16,885	2	19,400	36	111,627
4,443,957	823,891 36	278,833.6	267,316 85	148	67,887	2	17,014	4	26,569
6,309,389	$1,106,468 75	429,089.6	$410,707 10	190	$84,772	4	$36,414	40	$138,187

SUMMARY—

Number of Sub-division.		Bridges.		Waste weirs.		Locks.		
		No.	Cost.	No.	Cost.	No.	Lift.	Cost.
First division. Extending from Cumberland to Turkeyfoot.	Summit Level, - -	13	$1,750	-		-	-	-
	No. 1, East, - - From tunnel basin to Little Will's creek.	23	2,125	23		139	1,028	$1,028,000
	No. 2, East, - - From Little Will's creek to Cumberland.	18	2,890	6		39	309	309,000
	No. 1, West, - - From the west end of tunnel basin to Middle Fork creek.	7	950	9	$1,405	28	224	224,000
	No. 2, West, - - From Middle Fork creek to Turkeyfoot.	12	1,600	3	375	54	434	434,000
		73	9,315	41	1,780	260	1,955	1,995,000
Second division. Extending from Turkeyfoot to Pittsburg.	No. 3, West, - - From Turkeyfoot to Connellsville.	5	850	5	1,000	54	432	345,000
	No. 4, West, - - From Connellsville to Sewickly creek.	20	1,350	9	1,355	16	126.83	126,830
	No. 5, West, - - From Sewickly creek to McKeesport.	18	2,675		-	1	8	8,000
	No. 6, West, - - From McKeesport to Pittsburg.	23	3,395		-	2	11.50	11,500
		66	$8,270	14	$2,355	73	578.33	491,330

RECAPITULATION OF

First Division, - - - Extending from Cumberland to Turkeyfoot, being that part of the line denominated by the U. S. Board of Internal Improvement "the middle section."	73	9,315	41	1,780	260	1,995	1,995,000
Second Division, - - - Extending from Turkeyfoot to Pittsburg, denominated by the United States Board of Internal Improvement "the western section."	66	8,270	14	2,355	73	578.33	491,330
Totals, -	139	$17,585	55	$4,135	333	2,573.33	2,486,300

Continued.

Total cost of a 40 feet Canal, 4 feet deep.		Total cost of a 48 feet Canal, 5 feet deep.		Total cost of a 60 feet Canal, 6 feet deep.	
Cost of Sub-div.	Av. cost p.ml.	Cost of Sub-div.	Av. cost p.ml.	Cost of Sub-div.	Av.cst. p.ml.
$1,855,056	$99,968	$1,856,056	$99,968	$1,856,056	$99,968
1,341,288	83,830	1,370,618	85,663	1,489,218	93,076
488,143	32,354	515,553	34,170	560,983	37,181
466,398	32,165	503,042	35,382	528,425	36,443
722,097	42,382	773,216	45,383	811,379	47,623
4,873,982	71,808	5,018,485	73,940	5,246,061	77,290
963,939	35,701	1,067,284	39,529	1,083,979	40,147
781,497	28,864	840,607	31,046	876,681	32,379
421,622	25,322	454,877	27,320	473,218	28,421
321,650	21,463	351,408	23,380	368,734	24,602
$2,488,708	-	$2,714,176	-	$2,802,612	

THE WESTERN SECTION—Continued.

4,873,982	71,808	5,018,485	73,940	5,246,061	77,290
2,488,708	29,035	2,714,176	31,666	2,802,602	32,697
$7,362,690	47,939	7,732,661	50,347	8,048,673	52,404

CONDENSED ESTIMATE OF THE COST OF THE WHOLE LINE FROM GEORGETOWN TO PITTSBURG.

	Miles.	Chains.	Forty feet.	Average per mile.	Forty-eight feet.	Average per mile.	Sixty feet.	Average per mile.
EASTERN SECTION, as estimated by Geddes & Roberts, in 1827	186	61	$4,008,005	$21,301	$4,330,991	$23,239	$4,479,346	$23,980
WESTERN SECTION, as per foregoing estimates - -	153	47	7,362,690	47,938	7,732,661	50,347	8,048,673	52,404
	340	28	11,370,695	83,409	12,063,652	35,444	12,528,019	36,809

Extract from the report of General S. Bernard and Lieut. Col. Totten, of the United States' Board of Internal Improvement, on the several canal routes, examined in 1824, by orders of the War Department.

"*Western Section.*—Casselman's river is about 100 yards wide at its mouth; it is a fine river, and will give a great deal of water to the canal. At the driest season it offers from eight inches to one foot in depth; before joining the Youghiogany it receives Laurel Hill creek.

From the mouth of Casselman's river till you reach two or three miles above Connellsville, the Youghiogany forces through Briery mountain and Laurel Hill, and its bed is very deep. The left bank is very high and rugged, the right somewhat less. In this space of about 28½ miles, the canal must be frequently cut in a shelf on the sides of the valley, or run on embankments supported by a wall. The river has a fall of about sixteen feet at Ohiopyle falls; it is here about 150 yards wide.

Connellsville is considered as the head of navigation in the Youghiogany. In the driest season, it has here from eight inches to one foot in depth.

From Connellsville to Robstown the river winds during twenty-four or twenty-five miles; on all this extent, the right bank is far preferable to the other. Except in three or four places, where you meet with bluffs, it consists of flats or gentle slopes, where the canal can be run without difficulty. As to these bluffs, they consist of schistose rock, easy to work. The only stream of any importance which joins the Youghiogany between Connellsville and Robstown, is Jacobs' creek, and it gives but little water in dry seasons. That route is also intercepted by two or three deep ravines, which the canal must cross on aqueducts.

The distance between Robstown and M'Keesport is about sixteen miles. Along this route the right shore remains preferable to the other; it consists of a succession of flats and spurs, which, being of a schistose nature, and moderate height, will offer no considerable obstructions to the canal.

From M'Keesport to Pittsburg the right shore of the Monongahela offers a most favorable ground, except along two spaces of about a mile each, where rugged bluffs close on the river. The first is below Judge Wallis' and the field of Braddock's defeat, the second before reaching Pittsburg. The whole distance in following the right bank of the river is, between M'Keesport and Pittsburg, from fifteen to sixteen miles.

The highest floods of the Youghiogany occur between Casselman's river and Connellsville: they rise to eighteen feet. At Connellsville they rise from twelve to fifteen feet. Salt wells may be dug in its valley, coal and iron are abundant, and excellent materials for building: timber and stone are found all along it.

The preparatory surveys of this western section were not commenced during the last session (1824.) They can alone fix the general route of the canal. They will be directed on the following bases:

From Bear creek, the canal must follow the right shore of the valley, descending along the Youghiogany; and though it is most favorable, (presenting a rugged bank only for four or five hundred yards) when it reaches Selby's-port bridge, two lines of direction may be tried, one along the right, and the other along the left bank, to the old salt works. The depth and breadth of the valleys and ravines, which it will be necessary to cross on aqueducts,

will be measured, and the location of these aqueducts, and of the dams to form reservoirs will be fixed.

If, between Selby's-port and the old salt works, the left shore presents any advantages over the other, deserving the expense and trouble of crossing twice the Youghiogany, the location and dimensions of two aqueducts, one at Selby's-port, and one above the old salt works, will be determined, and a feeder led from Casselman's river to the latter.

From the old salt works to the Ohiopyle falls the canal must follow the right shore, which is most favorable; and then, crossing Indian creek, on an aqueduct, continue along the same bank to the paper mill four or five miles south of Connellsville. It will be proper to ascertain whether its line should not leave the valley of the Youghiogany above the Ohiopyle falls, and, running east, gain the southern branch of Indian creek, to rejoin the Youghiogany by descending Indian creek valley.

From the paper mill, the canal should be run at a sufficient elevation above the river, to leave the shore, and gain, if possible, the high level which lies east of Connellsville, in order to turn round the rugged bluff below that place. From thence, following the right shore, it will reach Robstown, after crossing, on aqueducts, Mount's creek and Jacob's creek. The localities and dimensions of these aqueducts must be determined, as well as the resources which these streams may afford to supply the canal, by turning them into reservoirs.

From Robstown to M'Keesport, keeping along the right shore, it must cross Sewickly creek over an aqueduct, whose dimensions and location must be determined. As this creek has two considerable branches, they must be examined, to determine whether reservoirs cannot be made in them.

From M'Keesport to Pittsburg, the canal will follow the right shore of the valley of the Monongahela, crossing, in succession, Crooked run, Turtle creek, and Nine Miles run, on aqueducts.

To ascertain whether, from paper mill, the right shores of the Youghiogany and Monongahela are certainly the best, a level should be run along their valleys on the left shore; and the locations and dimensions of the dams or aqueducts which it would be necessary to run through the Youghiogany, at M'Keesport, and through the Monongahela near its confluence with the Youghiogany, in case this route was adopted, should be fixed and calculated.

It will also be essential to try whether the canal might not turn to the west of that narrow and rugged portion of the valley of the Youghiogany, where it forces its way through Briery mount and Laurel Hill. For this purpose, a level should be run from Selby's-port, and some point of a proper elevation, and cross the Briery mount at the depression which it offers between the heads of Buffalo Marsh run and the eastern branch of Sandy creek. This level should then wind round the ravines of the head of the western branch of Sandy creek, till it met the Laurel Hill at the spot where it might be crossed by the shortest tunnel. When it reached its western slope, it should run northwardly along its foot, to descend by one of its ravines to the Youghiogany, opposite the paper mills.

On the whole, the western section of the canal, from the mouth of Bear creek to that of the Monongahela, at Pittsburg, offers no obstacles which may not be surmounted at a reasonable expense; and the waters of the Youghiogany, Bear creek, and Casselman's river, are amply sufficient to feed it. Large reservoirs may be formed in Bear creek and Casselman's

river, by throwing dams across them, and on the route from Casselman's to the paper mills, and at the mouth of the Youghiogany in the Monongahela. The practicability of this section is out of question.

Its length will be about 100 miles, and its descent from Bear creek to Pittsburg 584½ feet, as Pittsburg is 756 feet above the level of the ocean.

The investigation of the topography and water courses of the country, through which the Chesapeake and Ohio canal should run, and the results of our preparatory surveys, obtained up to the present moment, demonstrate that this noble enterprise is practicable; and, although we have not yet sufficient data to calculate the expense of the work, there is every probability that it will not bear any comparison with the political, commercial, and military advantages which it will procure to the Union."

The following is a description of the same section by the Board of Internal Improvement, in October, 1826, when consisting of S. Bernard, Wm. Tell Poussin, and William Howard, civil engineers:

"*Western Section.*—From the mouth of Casselman's to Connelsville (27½ miles,) the deep and narrow valley of the Yougheogany presents a variety of good building sandstone; and appearances of coal make it probable that limestone will be found in their vicinity.

On this distance 54 locks are to be located.

From Connelsville to Sewickly creek (27 miles,) sandstone and slate rocks form the sides of the valley; but, a few miles below Connelsville, appearances of coal, then limestone ledges, are met with; and, at four or five miles below Connelsville, banks of coal and of limestone are found.

On this distance 18 locks are to be erected.

From Sewickly creek to the mouth of the Yougheogany (16⅓ miles,) the bluffs of the valley are frequently of a ledge of very hard limestone, occurring just above high-water mark, and having a superincumbent structure of common rocky materials. This limestone quarries in regular prismoidal masses: some hope is entertained that it may produce an hydraulic lime.

On this distance but one lock is contemplated.

From the mouth of the Yougheogany to Pittsburg (14 miles,) the Monongahela runs through a limestone land, but the building materials do not appear at the surface of the ground.

On this distance 5 locks are to be located.

This summary shows, that along the whole line of canal, good building stone will be easily procured; but a proper choice will be requisite, and though, in locating finally the individual works, care will be taken to have them as near as practicable to the quarry, yet it cannot be anticipated that, in most cases, it will be possible to save, absolutely, the expenses attending the transportation of stone materials from the quarry to the very spot where they will be required. The means of transportation will vary according to local circumstances: at some places, boats will be resorted to; at others, land carriage will be more convenient; often inclined planes will be used, and especially when the quarry will be on the flank of the valley, and above the work to be erected."

The line of the western section subsequently adopted for the Chesapeake and Ohio canal, corresponds with that described above by the United States' engineers, for about two-thirds of the way, or from Casselman's river down to Pittsburg; the line above the mouth of that river having been so altered

since this report, by the same engineers, as to turn up the river Casselman, towards a better pass of the Alleghany, and by a much shorter route, towards he town o f Cumberland.

(H.)

Comparative cost of the various works on the western and eastern sections of the State canal of Pennsylvania.

The river Alleghany, uniting with the Monongahela, after it has received the Yougheogany about 12 miles above Pittsburg, forms the Ohio at that city, the proposed termination of the Chesapeake and Ohio canal.

A canal, from Pittsburg, up the Alleghany, Kiskiminetas, and Conemaugh rivers, to Johnstown, 104 miles in length, has already been constructed. The country along the line of this canal, and that along the Monongahela and Yougheogany rivers, up which the western section of the Chesapeake and Ohio canal, is to be extended, is, in truth, the same. The cost, therefore, of the works on the canal, already finished, may be assumed to be the measure of the cost of the other: and, for this reason, it is deemed expedient to insert the following extract from a report of the commissioner of the Western canal of Pennsylvania.

Extract from a communication of A. Lacock, Esq. dated Canal Office, December 15, 1827, to the Board of Canal Commissioners of Pennsylvania.

"By the voluminous reports of the engineers, the board will learn what has been accomplished, and what remains to be done, on this division of the Pennsylvania canal, of which the following is a brief extract:

There has been, of

Excavation of earth - - - - -	yards,	1,522,436
Do. rock - - - - -		350,837
Embankment made - - - - -		692,718
Stone wall for protection - - - -	perches,	22,398
Mason work in locks, aqueducts, culverts, and bridges -		32,307

It must be evident that the principal expense of a lock and canal navigation will arise from, and be applicable to, the work comprehended under the foregoing heads, taken conjointly; and to settle a question that has been made a subject of dispute, an exact average has been made of the actual cost on each branch of the work upon this line, and the following result has been obtained:

	D.	C.	M.
Average price of earth, per cubic yard - - -	00	07	1
rock, do - - -	00	39	7
embankment - - -	00	10	2
wall, per perch - - -	00	52	5
road and farm bridges - - -	145	00	0
fencing canal, by the perch, with posts and boards - - - -	00	75	0
locks, per foot lift, complete - -	578	50	0

The gross amount of money received by the acting commissioner, from the treasurer of the board, has been, up to this date - - - - - - 510,500 00 0
And his disbursements in the public works amount to - 535,816 42 0
Leaving the balance due him from the Commonwealth - 25,316 42 0"

The contract prices, (undoubtedly less than the actual cost) of the like work in the eastern section of the Pennsylvania canal, running through a country, much resembling the valley of the Potomac, to which it is parallel, will be seen in the subjoined synopsis by, Mr. James Clarke, superintendent of the Juniata division of that canal, submitted to the Board of Commissioners, of which he was a member, cotemporaneously with the preceding report of Gen. Abner Lacock.

EXHIBITING the average prices at which the various kinds of work were taken, at the several lettings on the Juniata division of the Pennsylvania Canal.

Date of the lettings.	No. of sections let.	No. of proposals for work.	AVERAGE RATE AT WHICH THE WORK WAS GIVEN OUT.									
			Excavation.	Embankment.	Puddling	Solid rock.	Slate rock.	Hardpan.	Vertical wall.	Outside slope wall	Inside slope wall	Grubbing and clearing.
			CENTS PER CUBIC YARD.						Cents per perch of 25 cubic feet.		Cts. per sq yard.	
1827—Aug. 15	35	724	9	13½	18½	42¼	24¼	19	39	49	13	$170
29	28	652	8½	12½	16¾	42¾	22¾	17¼	42¾	45¼	12½	76
Sept. 12	28	562	8¾	13	15½	43½	23½	17¼	45	50½	12½	160
Average of 91 sections - -			8¾	13	16½	42¾	23½	18	42¼	48¼	12⅔	135⅓

Upwards of 700 proposals were received between the 10th and 13th of October last, for doing the stone and wood work along this line of canal; which work has been allotted to competent bidders, at reasonable prices.

JAMES CLARKE, *Superintendent.*

CANAL OFFICE, *Millerstown, Nov.* 24, 1827.

For a perfect description of the country through which the western section of the Chesapeake and Ohio canal will pass, see the preceding note (G.)

(I.)

The mole at the mouth of Rock creek is constructed of the earth removed from section A, where it passes through Georgetown, by a cut exceeding thirty feet in depth. It is fair to balance the expense of this mole by an estimate of its value, when applied to commercial uses, by the construction of a line of warehouses eighty feet deep, with two streets, affording them a double front, one on the canal, and one along the river. A basin, moreover, at the end of a canal is, properly speaking, essential to its entire trade, and cannot be properly charged on a particular subdivision of a section of the canal.

(K.)

For the resolutions of the first Washington Convention, which assembled in 1823, see (N.) post.

(L.)

The right to sell or let the surplus water of the canal was denied by the charter of the company, except where wastes necessarily occur, from an apprehension that, if the canal were of narrow dimensions, the right might be abused by the disposal of so much water as to create a downward current, to the injury of the navigation.

This, it is proposed to avoid, by an enlargement of the dimensions of the canal along the first level, next each feeder from the main river, to such extent, as to admit of the flow of a large body of water, and, by confining the sale of the surplus water, so admitted, to that level.

To the acquisition of this power, it has been objected that it would interfere with private rights. But the grant could reserve, expressly, any such rights, provided they be found to have existence. It has also been objected that the company should not engage in manufactures; but this is not designed or desired by the stockholders, who ask only to be permitted to sell or let the surplus water of the canal, and are, by the Pennsylvania charter, expressly interdicted from employing for manufacturing purposes, in any other way than by selling or letting, the necessary water. It is believed, that, unless the Chesapeake and Ohio Canal Company acquire the power of so using the surplus water of a river which, being a public highway of two States, no individual has a right to divert from its natural channel, the power must remain forever dormant and unprofitable.

(M.)

A letter from the undersigned members of the House of Representatives to the President of the United States, dated

WASHINGTON, *March* 2, 1829.

SIR: The undersigned, members of the House of Representatives, duly impressed with the importance of uniting, by the closest ties of intercourse,

those portions of the United States which are at present divided by continued chains of lofty mountains, and especially the extensive slopes descending from the Alleghany, westwardly, towards the Mississippi and the gulf of Mexico, and, eastwardly, to the Atlantic; and understanding that, by the existing laws, the soldiers of the regular army may be employed on works of public utility, beg leave to recommend to your consideration the expediency of concentrating, near the proposed tunnel for uniting the waters of the Chesapeake and the Ohio, a portion of the army; and of directing its labor, under the inspection of skilful engineers, first, in sinking the necessary air and working shafts for constructing the said tunnel, and, next, in completing the same in the shortest practicable period.

The labor which these works would require of the troops bears a peculiar analogy to some of the most difficult, and, in Europe, the most frequent operations of war; while the instruments employed in them are such as impart additional strength to the arm of the soldier, and render him more formidable to his enemy.

If objections were made to the subterranean character of the labor on the score of health, an answer to them would be found in the unremitting vigor and cheerful alacrity, with which the hands engaged on the coal mines of James river perform their daily tasks, in pits sunk below the level of tide water. The proposed tunnel, on the contrary, will be rendered, by its great elevation above the adjacent valleys of the Alleghany, both dry and healthful.

A force not exceeding one thousand men, stationed as is here proposed, would greatly accelerate the completion of the tunnel; while its position, during the continuance of its useful labor, would render it as efficient for the public defence, as if it were distributed as at present, where its labor, as the undersigned have been credibly informed, is often misapplied.

The distance from the tunnel to the navigable waters of the Potomac does not exceed thirty-one miles, and to the Monongahela, seventy; while access to both is opened, from Smithfield, by the Cumberland road, at a distance not exceeding forty miles from either.

To supply the troops employed in the service with an incentive to labor with greater alacrity, the undersigned have no doubt, but that, if their recommendation shall accord with the views of the Executive Department, the Congress would increase the compensation now allowed for extra labor; and the more readily, as the motives to desertion, which now thin the ranks of the army, would be diminished by the enhanced compensation of the soldier, the wholesome occupation given him, and the absence of all countervailing temptations to dissipation and excess.

The undersigned are aware that the authority to construct the proposed work has been expressly vested in the Chesapeake and Ohio Canal Company, by their charter—itself a compact between the United States and the States of Virginia, Maryland, and Pennsylvania; but they are well assured that an arrangement might be made with that company, alike beneficial to their interest and the great and useful end which the undersigned have in view, as to the general health and efficiency of the army.

The undersigned are also apprised that doubts exist as to the expediency of crossing the Alleghany, in the proposed route, by a canal or railway; and, accordingly, that authority has been granted to the Chesapeake and Ohio Canal Company, by an early amendment of their charter, to effect their passage across this formidable barrier in either mode. The construction of the

tunnel, by overcoming a rise and fall of 1,700 feet in the short compass of four miles, would prove, however, alike beneficial to either of these modes of communication between the eastern and western waters.

It is not designed, by a special recommendation of the proposed work on the Alleghany, to limit, in any respect, the Executive discretion, to which, the employment of the troops, on useful public enterprises, is confided by the laws. The undersigned believe that the efficiency of the army in war, apart from the valuable military use of the works which it may construct, would be promoted by a judicious application of its labor in peace.

We have the honor to be, with great respect, your obedient servants.

John Kincaid,
T. Beekman,
H. R. Storrs,
J. C. Isacks,
John Davis,
S. Pettis,
John Test,
S. A. Smith,
Innis Green,
James Ford,
R. M. Johnson,
A. C. Martindale,
John Blair,
A. H. Sevier,
Thomas Chilton,
P. L. Tracy,
J. Richardson,
James L. Hodges,
John Thomson,
Lewis Maxwell,
George Grennell, jr.
William L. Storrs,
Joseph G. Kendall,
Timothy Childs,
Richard Spencer,
Joseph Duncan,
Robert S. Rose,
Edward B. Dudley,
Lewis Williams,
W. B. Shepard,
Joseph M. White,
Jonathan Hunt,
D. L. Barringer,
James Clark,
Joseph H. Crane,
Isaac Pierson,
M. Bartley,
H. B. Cowles,
H. Daniel,
Robert Craig,
Dutee J. Pearce,
Edmund Deberry,
Horace Everett,
Richard M. Cooper,
C. F. Mercer,
B. I. Semmes.
Harmar Denny,
John Bailey,
P. Doddridge,
John D. Dickinson,
E. F. Norton,
John Varnum,
Thomas Irwin,
Wm. McCreery,
Thamas H. Sill,
George C. Washington,
John Gilmore,
C. Forward,
J. B. Sutherland,
William Armstrong,
M. C. Sprigg,
D. H. Miller,
R. C. Mallary,
Samuel Swann,
Tristam Burges,
Clement Dorsey,
W. Ramsey,
David Crockett,
Philander Stephens,
Robert P. Letcher,
Elisha Whittlesey,
Lewis Condict,
Thomas H. Hughes,
William Stanberry,
William Creighton, jr.
Robert E. B. Baylor,
William Kennon,
J. Hawkins.

DEPARTMENT OF WAR,
October 8, 1830.

Hon. CHAS. F. MERCER, and others:

GENTLEMEN: The President of the United States has taken into consideration the memorial which you addressed to him last summer, recommending the employment of one thousand soldiers of the regular army, under skilful engineers, in constructing a tunnel contemplated to unite the water of the Chesapeake and Ohio. He has directed me to say, that it is doubted whether the obligations of a soldier impose upon him, as a duty, the performance of such work, as suggested in your memorial; and that the troops could not be withdrawn from their respective stations and duties, without detriment to the public interest.

PHILIP G. RANDOLPH,
Acting Secretary of War.

That the policy which the preceding memorial recommends to the President of the United States, of employing the army on public works, is not new, may be shown, by referring as well to ancient as modern examples, and to the opinions, proceedings, and practice of our own Executive and Legislative councils.

The Roman military roads traversed not only Italy, the seat of the empire, but its remotest provinces. The number leading directly from Rome, herself, exceeded twenty, and reached, in extent, more than fifty thousand miles.

In France, numerous highways, far surpassing those of Rome in magnificence, and useful as splendid, have been the work of the army.

The historians of Scotland number among the most efficient causes of the civilization of her Highland clans, those military roads constructed by the troops of General Grant, under the orders of the British Government, immediately after the rebellion of 1715.

In our own country, near twenty years ago, a member of the delegation from Virginia, submitted to the House of Representatives, the following resolution:

Extract from the Journal of the proceedings of the House of Representatives of the 12th April, 1812.

"A motion was made by Mr. Randolph," (late Senator from Virginia,) "that the House do come to the following resolution:

"*Resolved*, That the President of the United States be authorized to employ the regular army of the United States, when not engaged in actual service, and when, in his judgment, the public interest will not thereby be injured, in the construction or repair of fortifications, *roads*, *canals*, or other *works of public utility*."

In reply to a resolution of the House of Representatives of the 4th of April, 1818, the present Vice President of the United States, then Secretary of War, made a report, which was read in the House, and ordered to be printed on the 14th of January following, in which he voluntarily recommends the employment of the army on roads and canals; and, by a correspondence accompanying his report, shows that, to some extent, they had been so occupied.

With a view to vindicate this policy, the following extracts from the report and correspondence are here inserted:

"DEPARTMENT OF WAR,
"*January* 7, 1819.

"To the Hon. HENRY CLAY,

"*Speaker of the House of Representatives:*

"Sir: In compliance with a resolution of the House of Representatives of the 4th of April, 1818, 'instructing the Secretary of War to report to that House, at their next session, a plan *for the application of such means as are within the power of Congress* for the purpose of opening and constructing such *roads and canals* as may deserve and require the aid of Government, *with a view to military operations in time of war; the transportation of munitions of war;* and, also, a statement of the works of the nature abovementioned which have been commenced, the progress which has been made, and the means and prospect of their completion; and together with such information as, in the opinion of the Secretary, shall be material in relation to the objects of the resolution;' I have the honor to make the following report:

"A judicious system of roads and canals, constructed for the *convenience of commerce*, and the *transportation of the mail only, without any reference to military operations*, is itself, among the *most efficient means* for "the more complete *defence of the United States.*" Without adverting to the fact, that the roads and canals which such a system would require, are, with few exceptions, precisely those which would be required for the operations of war; such a system by consolidating our Union, increasing our wealth and fiscal capacity, would add greatly to our resources in war."

"There is no country to which a good system of *military* roads and canals is more indispensable than to the United States.

"Opposed in principle to a large standing army, our main reliance for defence must be on the militia, to be called out frequently from a great distance, and under the pressure of an actual invasion. The experience of the late war, amply proves, in the present state of our internal improvements, the delay, the uncertainty, the anxiety, and exhausting effect, of such calls. The *facts* are too *recent* to require details, and the impression *too deep* to be *soon* forgotten. As it is the part of wisdom to profit by experience, so it is of the utmost importance to prevent a recurrence of a similar state of things, by the application of a portion of our means to the construction of such *roads and canals* as are required, with a view to military operations in time of war, the transportation of the munitions of war, and more complete defence of the United States.

"If Louisiana were connected by a durable and well finished road with Maine, and Boston with Savannah, by a well established line of inland navigation, for which so many facilities are presented, more than half the pressure of war would be removed."

"It remains, in relation to the defence of the Atlantic frontier, to consider the means of communication between it and the western States, which require the aid of the Government.

"The interest of commerce and the spirit of rivalry between the great Atlantic cities, will do much to perfect the means of intercourse with the West. The most important lines of communication appear to be from Albany to the lakes; from Philadelphia, Baltimore, *Washington*, and Richmond, to *Ohio river*, and from Charleston and Augusta to the Tennesssee; all of which are now commanding the attention, in a greater or less degree, of the sections of the country immediately interested. But in such great

undertakings, so interesting in every point of view to the whole Union, and which may ultimately become necessary to its defence, the expense ought not to fall wholly on the portions of the country more immediately interested. *As the Government* has *a deep stake* in them, and as the *system of defence* will not be perfect *without their completion, it ought, at least, to bear a proportionable share of the expense of their construction.*

"For the construction of the roads and canals which Congress may choose to direct, *the army*, to a certain extent, may be brought in aid of the monied resources of the country.

"The *propriety of employing the army on works of public utility cannot be doubted.* Labor adds to its usefulness and health. *A mere garrison life* is equally hostile to its vigor and discipline. Both officers and men become the subjects of its deleterious effects. But when the vast extent of our country is compared with the extent of our military establishment, and taking into consideration the necessity of employing the soldiers on fortifications, barracks, and roads, connected with remote frontier posts, we ought not to be sanguine in the expectation of aid to be derived from the army in the construction of permanent military roads and canals, at a distance from the frontiers. When our military posts come to be extended up the Mississippi and Missouri as far as is contemplated, the military frontier of the United States, not including sinuosities, and the coasts of navigable bays and lakes opening into our country, as was stated in a former report, will present a line of more than 9,000 miles, and including them, of more than 11,000. Thinly scattered along so extensive a frontier, it will be impossible, I fear, without leaving some points exposed, to collect any considerable bodies in the interior of the country, to construct roads and canals.

"As connected with this subject, I would respectfully suggest the propriety of making an adequate provision for the soldiers, while regularly and continually employed in constructing works of public utility. The present allowance is fifteen cents a day, which is considered sufficient in occasional fatigue duty, such as is now done at most of the posts; but if systematic employ, on permanent works, should be made the regular duty of the soldiers who can be spared for that purpose, a compensation, taking into the estimate the obligation of the Government to provide medical attendance and pensions to the diseased and disabled soldiers, not much short of the wages of daily labor ought to be granted to them. Without such provision, which is dictated by justice, an increase of desertion, and difficulty in obtaining recruits, ought to be expected. Among the leading inducements to enlist, is the exemption from labor; and if the life of a soldier should be equally subjected to it as that of other citizens in the same grade, he will prefer, if the wages are much inferior, to labor for himself to that of laboring for the public. The pay of a soldier is $60 per annum; and if he were allowed, when employed permanently on fatigue, 25 cents a day, and suppose him to be employed 200 days in the year, his compensation, including his pay, would be $110 per annum; a sum, it is thought, considerably short of the average wages of labor. If this sum should be allowed, the greater portion of it ought to be paid at the expiration of the term of enlistment. If fifteen cents a day were so reserved, and the soldier should be employed one thousand days in the five years for which he is enlisted, it would constitute a sum of $150, to be paid at the expiration of his term, which ought, in the same manner as the bounty land, be made to depend upon an honorable discharge.

This would furnish an important hold on the fidelity of the soldier, and would be a powerful check to the great and growing crime of desertion. An honorable discharge is now worth but little to the soldier, and the consequence is, that desertions are more frequent with those enlisted since the war than those who were then enlisted, and are entitled to the bounty in land on their honorable discharge. The latter patiently waits the expiration of his term of service, while the former frequently seizes the first favorable opportunity for desertion.

"Should Congress think proper to commence a system of roads and canals for the "more complete defence of the United States," the disbursements of the sums appropriated for the purpose might be made by the Department of War, under direction of the President. Where incorporate companies are already formed, or the road or canal commenced under the superintendence of a State, it perhaps would be advisable to direct a subscription on the part of the United States, on such terms and conditions as might be thought proper. In other cases, and where the army cannot be made to execute it, the work ought to be done by contract, under the superintendence and inspection of officers of the engineer corps to be detailed for that purpose. It is thus the Government will be able, it is thought, to construct on terms at least as favorable as corporate companies. The system of constructing all public works which admit of it, by contract, would be attended with important advantages. It has recently been adopted in the construction of fortifications, and it is expected will be attended with beneficial effects. The principal works at Mobile and New Orleans have been contracted for on terms considerably under the estimates of the engineers. With such a system extended to military roads and canals, combined with a careful inspection and superintendence by skilful engineers, will enable the Government to complete them with economy, durability, and despatch.

"In the view which has been taken, I have thought it improper, under the resolution of the House, to discuss the constitutional question, or how far the system of internal improvements which has been presented may be carried into effect on the principles of our Government; and therefore the whole of the arguments which are used, and the measures proposed, must be considered as depending on the decision of that question.

"The only military roads which have been commenced, are, from Plattsburg to Sackett's Harbor, through the Chataugay country; from the southern boundary of the State of Tennessee, and crossing the Tennessee river near the Muscle Shoals, to Madisonville, Louisiana; and from Detroit to Fort Meigs, at the foot of the rapids of the Miami of the Lakes. Documents marked A, B, C, show the progress which has been made. These roads have been commenced, and thus far completed, by the labor of the soldiers, who, while they are so employed, receive fifteen cents per day, with an extra allowance of a gill of whiskey. The labor of the troops is the only means within the reach of the department of completing these roads; and as the troops are so employed only when they are not engaged in active service, it is impossible to state with accuracy when the roads will be completed.

(Signed) "J. C. CALHOUN."

Extracts from the correspondence referred to in the preceding report.

Letter of Maj. Gen. Jacob Brown, commander in chief of the American army, to the Hon. John C. Calhoun, Secretary of War, dated

HEAD QUARTERS, BROWNSVILLE, *Dec.* 6, 1818.

"It is due to the command of Col. Brady and of Col. Atkinson, to say, that they have discovered not only a becoming cheerfulness in obeying the orders received for perfecting the Plattsburg aud Sackett's Harbor road, but much zeal in the performance of this duty; and if their regiments are continued upon this important work the next season, more than double the length of the way will be completed than has been passed the last and the present season."

The southern division of the army was then under the command of Gen. Andrew Jackson, and the next letter in this correspondence, is from Col. Butler, the Adjutant General of his division.

"HEAD QUARTERS, DIVISION OF THE SOUTH,

"*Adjutant General's Office,*

"*Nashville, September* 19, 1818.

"SIR: On the eve of setting out for the Chickasaw treaty, I deem it necessary to inform you that no reports have been received, as yet, of a particular character, in relation to the military road now opening from Columbia, Tennessee, to Madisonville; but I am enabled to inform you officially, that fifty miles have been completed by the troops on the lower part of the road, making many causeways and bridges of the most durable materials; and the detachment on this end have progressed about forty miles south of Tennessee river, making, in like manner, many bridges and causeways.

"It is considered that the most laborious part of the road has been completed; and, from every information, it has been done in the best manner. An increase of men has been recently afforded to the detachment south of Tennessee river, which will enable it to progress with much greater facility.

"Should I receive minute reports shortly, I shall communicate their contents without delay.

"And have the honor to be,

"Very respectfully, your most ob'dt serv't.

"ROBERT BUTLER,

"*Adjutant General.*"

"JOHN C. CALHOUN, Esq.

"*Secretary of War.*"

From Maj. Gen. Alexander Macomb, the present commander in chief of the army, to the Secretary of War.

"HEAD QUARTERS, DETROIT,

"*November* 2, 1818.

"SIR: I have the honor to report, that the military way directed to be opened from this place to the Rapids of the Miami, has progressed as far as the Eight Mile creek, that is, within eight miles of the Rapids, making in all a distance of seventy miles. The road is truly a magnificent one, being

eighty feet wide, cleared of all the logs and underbrush, every low place causewayed, and all the creeks and rivers requiring it, bridged in a substantial manner. The number of causeways exceed sixty, and the bridges are of considerable length. The one on which the troops are now employed, is four hundred and fifty feet in length, constructed of strong oak framed work. It is found impossible to complete the road to the Rapids this season, on account of the time and labor required in throwing bridges over the larger streams: it was also deemed more essential to complete the bridges, than cut the road this season to the Rapids, as the road would be useless without the means of crossing the large streams.

"The officers and soldiers who have been employed on this service deserve much credit for the zeal and preseverance they have displayed on this occasion. The work they have performed has proved highly beneficial, both to the people of the country and to the Government. Besides greatly adding to the defence and strength of this frontier, the road has been the means of developing the richness of the public lands in this Territory, and greatly augmenting their value.

"As soon as Major Anderson, topographical engineer, can complete the survey of the road, a more minute and particular description of the work will be forwarded.

"I have the honor to be,
"With great respect, sir,
"Your ob't and very humble serv't,
"ALEX. MACOMB."

"The Hon. J. C. CALHOUN,
Secretary of War, &c. &c. &c."

A more unequivocal evidence of the opinion of the present chief magistrate in favor of such employment of the army, is furnished by recurrence to the printed report of a debate in the Senate of the United States, on the 20th of January, 1823, during the consideration of a bill from the House of Representatives, to authorize the laying out and opening certain public roads in the Territory of Florida.

The act, as it passed, with a vote of twenty-eight Senators, to eight, in its favor, provided for a road from Pensacola to St. Augustine, and from Cape Sable to the intersection of the former with the Suwaney river. The second section of the act authorized the President "to employ the troops of the United States, stationed in Florida, in such manner *as he may think proper*, in the *completion*, or *in assisting* in the completion of the said road."

In aid of the troops the act appropriated $23,000.

The passage of the bill, though resisted without effect, occasioned a debate, which appears in the number of the National Intelligencer of the 23d of February, 1823, from which an extract follows:

"The bill from the other House, to authorize the laying out of a road in the Territory of Florida, was taken up in Committee of the Whole. The bill proposes an appropriation of $20,000 for the purpose of making a road from Pensacola to St. Augustine, and $3,000 for the purpose of surveying routes for two other roads intersecting said Territory at different points."

After some introductory explanation of the bill by Mr. Brown, of Louisiana, the report gives the following remarks from General Jackson, then a Senator of Tennessee.

"Mr. Jackson said, the road was of great importance from two considerations; the first as it related to the defence, the second in regard to the population of that country. If gentlemen would recur to the map of the Territory, they would perceive that it would be absolutely impossible to succor St. Augustine except by water.

"The road could be made at small expense, and would furnish the means of immediate defence. He thought the United States ought to keep an eye on that part of the country; it is now very weak and defenceless. Without this road, people could not be induced so speedily to emigrate to that Territory, and its settlement would be retarded."

In reply to an inquiry of Mr. Lowrie, of Pennsylvania, "Mr. Jackson further said, he did not doubt that the appropriation provided in this bill, with the *labor of the military force* stationed in that part of the country, would be adequate to the proposed objects. He said, that, by this means, a topographical view of the country, through which the roads were to run, would be obtained, and the President would not apply more money to the purpose than should be found necessary."

"Mr. Chandler thought that must be a very extraordinary country indeed, if twenty thousand dollars would make three hundred miles of road in it. We have been told that the soldiers could not work in that country."

"Mr. Jackson said, he had himself marched through a considerable part of that country, and was enabled to open roads at the rate of twenty miles a day. If an army was able to open a road at that rate, he believed that $20,000 would be a sufficient sum for this purpose. He had no doubt it would be sufficient, unless bridges were to be made over the streams, which he believed was not intended."

The yeas and nays were called, and the vote was as follows: Yeas—Messrs. Barton, Branch, Brown, Eaton, Edwards, Elliott, Findlay, Gaillard, Hayne, Holmes, of Maine, Holmes, of Mississippi, Jackson, Johnson, of Louisiana, King, of Alabama, Lanman, Lowrie, McIlvaine, Mills, Parrot, Ruggles, Seymour, Smith, Talbot, Taylor, of Indiana, Thomas, Van Buren, Ware and Williams—twenty-eight Senators voting for the bill; and Messrs. Bell, Chandler, Clayton, De Wolf, Knight, Macon, Taylor, of Virginia, and Van Dyke, eight Senators, voting against it.

At the next session of Congress, the same distinguished Senator from Tennessee, acting as chairman of the Military Committee of the Senate, upon a memorial of the General Assembly of the State of Louisiana, praying "that measures may be taken, either *by the labor of the troops*, or in such other way as may be deemed proper, to construct a road on both sides of the river," (Mississippi,) "from Fort St. Philip to the English Turn," (a distance of about seventy miles, as the report and document show,) made the report, which appears among the printed documents of the Senate, in the following language:

"18th Congress, 1st Session. In Senate of the United States, January 23d, 1824. Mr. Jackson, from the Committee on Military Affairs, to whom was referred the report of the Secretary of War, respecting a military road from Fort St. Philip to the English Turn, made the following report:

"That your committee has had the same under consideration, and fully agree in the sentiment expressed in the memorial of the Legislature of the State of Louisana, that Fort St. Philip is a post of the utmost importance to the defence of New Orleans, being the only fortress to prevent the approach of an enemy to that city by the river Mississppi, and that that fort

may be very much endangered by reason of the extreme difficulty of communicating with it. That during the late siege by the British forces, this difficulty was sensibly felt; and it was greatly feared that it might lead to its capture, for want of a road by which it could be reinforced. Your committee, therefore, view a military road, leading from Fort St. Philip to the English Turn, as absolutely necessary to the defence of New Orleans, and to the safety of that fortress, in a state of war; and have reported a bill, authorizing the President to cause the said military road to be made agreeably to the report of the Engineer Department, and the memorial of the Legislature of Louisiana, herewith presented for the information of the Senate."

It is believed that before this period, or any express authority given to the Executive by Congress, the troops of the United States were occasionally employed and received extra pay, for fatigue duty, while at work on public roads, by order of the President of the United States.

But repeated acts of Congress have since specially directed such employment of them.

Such are, among others, "An act, approved March 3d, 1827, authorizing the completion and *repairs* of certain roads in the Territory of Florida, and for other purposes," which provides for opening the *public road* "from the Georgia line, by St. Augustine, to New Smyrna on the Atlantic, at the head of Indian river;" and, by its second section, "authorizes the President to employ the troops of the United States stationed in Florida, in such manner as he may think proper, in opening and repairing the said road," and appropriates $11,000 to that object.

Another "Act to provide for the completion of the road from Memphis, in the State of Tennessee, to Little Rock, in the Territory of Arkansas, and for other purposes," approved March 3d, 1827, authorizes the employment of "such part of the troops of the United States as the President may think proper, to *survey* and construct a road from Fort Smith, on the Arkansas river, to Fort Towson, on the Red river, and thence in the direction of Natchitoches."

Such is the tenor of an act subsequent to the last, "To open the King's road in Florida;" also, of "An act to complete the road from Pensacola to St. Augustine," which passed in the session of 1827 and 1828. An act approved May, 24th, 1828, "To provide for opening and making a military road in the State of Maine," authorizes the President "to employ such part of the troops as he may think proper, to *survey and construct* a road" from the Penobscot to Mars' Hill, near "the eastern boundary of Maine," and appropriates, moreover, $15,000 to the object.

The authority of the President to employ the army on such public works, under the existing terms of enlistment, being thus sustained by the long settled practice of the Government, and the approbation as well as the acquiescence of military men, in conformity with the policy laid down in the able report of a former Secretary of War, now the Vice President of the United States, the exercise of this power, in the mode proposed by more than seventy members of the present Congress, may be confidently expected; and, in that event, the entire line of the Chesapeake and Ohio canal may be completed in less than five years from the commencement of the tunnel through the Alleghany. If it be objected that the utility of the whole work should await the issue of the railroad experiments now in progress in Europe and America, then it should be deemed sufficient to state, that, on the railway contemplated by Pennsylvania, between the Juniata and Johnstown on the Conemaugh, a branch of the Alleghany river, *a tunnel* of one mile

passing through the dividing mountain at a depth of 177 feet below its summit, and under an elevation of 1264 feet above the canal, has been recommended, as essential to the success of that work, by an engineer of established reputation, who recently traversed Europe, in his zeal to master the science and practice of his profession. Tunnels being, in fact, as frequent on railroads, in Europe, as on canals; and reaching in some cases, on the latter, very near or quite the length here proposed, without the same facilities in their construction for disposing of their excavated materials; although, it is admitted, without ever passing under as great an elevation of superincumbent ground. On a single railroad proposed to be constructed in Scotland, no less than three tunnels are recommended, and that between Liverpool and Manchester begins with a tunnel.

(N.)

The origin of the controversy, and the causes of the rejection of the compromise, of the suit between the Chesapeake and Ohio Canal Company and the Baltimore and Ohio Railroad Company.

That the interference which has occurred between the locations of the Baltimore and Ohio railroad and the Chesapeake and Ohio canal could not have been anticipated by the friends of the latter prior to its occurrence, will be obvious from a perusal of the subjoined extracts from public documents.

Extract from a pamphlet printed in Baltimore, in the year 1827, entitled "Proceedings of sundry citizens of Baltimore, convened for the purpose of devising the most efficient means of improving the intercourse between that city and the western States," which shows that the founders of the Baltimore and Ohio railroad, in a publication designed to recommend their enterprise to the States who granted their charter, avowed a determination to make a *direct road* from Baltimore to the Ohio river, one hundred and forty miles shorter than the ascertained length of the route to the Ohio, from Baltimore, by the Chesapeake and Ohio canal.

"BALTIMORE, *February* 12, 1827.

"At a meeting of a number of citizens to take into consideration the best means of restoring to the city of Baltimore that portion of the western trade which has lately been diverted from it by the introduction of steam navigation, and by other causes, William Patterson, Esq. was appointed chairman, and David Winchester, secretary.

"Various documents and statements, illustrating the efficiency of railroads for the conveying of articles of heavy carriage at a small expense, were produced and examined; and the superior advantage of this mode of transportation over turnpike roads or canals, in many situations, being, according to those statements, satisfactorily shown, it was, on motion, resolved that the said documents be referred to a committee, whose duty it shall be to examine the same, together with such other facts and experiments as they may be able to collect; and, when prepared, to report their opinion thereon, and on the course it may be deemed proper for this meeting to pursue.

"*Resolved*, That Philip E. Thomas, Benjamin C. Howard, George Brown, Talbot Jones, Joseph W. Patterson, Evan Thomas, and John V. L. M'Mahon, compose the said committee.

"Adjourned to meet on Monday evening, the 19th instant."

"At a meeting held, pursuant to the foregoing adjournment, February 19, 1827, William Patterson, Esq. was called to the chair, and David Winchester was appointed secretary. The committee produced the report:

"The committee to whom were referred sundry documents and statements, illustrating the relative or comparative advantages of canals and railroads, for connecting the trade of the city of Baltimore with the western States, having carefully examined the said documents and statements, together with such additional facts and evidences as they have been able to collect, beg leave now to submit the following report:"

Extracts from this report, of quotations from other works.

"A railway is equally suited to a mountainous or level country, and either horses or locomotive engines may be used upon it, (though not with advantage, at the same time, from their difference of velocity) the wagons being drawn along by the locomotive engine, which derives its motion from the contact and friction of the wheels against the rails, the wheels being attached directly to the steam engine. Where a railway is level, the power required to move the wagons is little more than the friction, which is found to amount to about a 200th part of the weight to be conveyed; or, in other words, a power of one pound applied in the direction of the motion will draw forward 200 pounds.

"Where ascents and descents were unavoidable, they were obviated by the introduction of inclined planes, up which the loaded wagons were drawn by stationary engines, or the loaded wagons descending drew up the empty ones.

"Canals take the richest land, and are circuitous by following the valleys, and the carriage from them is ascending. Railways may pass along the tops and sides of hills, from whence the carriage of coals and heavy goods will be conveyed into the neighborhood without the obstacles of hills, and their elevation admits of branches from them, at little expense, wherever mines or a populous village make it desirable.

"The committee (say they) are much gratified to find themselves fully sustained in the opinion they have here endeavored to enforce, of the superiority of a railroad over any other means of communication between the city of Baltimore and the western States, by a very able report, lately made by a committee of the Legislature of Massachusetts, who, it appears, had been appointed to ascertain the most eligible means of opening a direct inland communication between Boston and the Hudson river at Albany. The district of country between those places being in many respects similar to that between us and the Ohio river, renders this report the more interesting to us: the committee, therefore, take leave to offer the following extracts from it."

The committee, after showing the importance of the proposed railroad, by many extracts from the report of the United States' engineers on the plan, route, and estimated cost of the Chesapeake and Ohio canal, which manifest their familiar acquaintance with the proposed direction of that work along the valley of the Potomac, proceed to give the following description of their own enterprise. They tell the public, in characters sufficiently large, that—

"In conclusion, the committee beg leave to refer to the annexed tables, numbered from 1 to 7, in which they have arranged, under a condensed form, some of the more important facts and statements embraced in this re-

port. The committee have also in these tables contrasted the advantages which, in their opinion, would be likely to accrue to the city of Baltimore from connecting her trade with the western States, by intersecting the contemplated Chesapeake and Ohio canal within the District of Columbia, and by A DIRECT RAILROAD FROM BALTIMORE TO SOME ELIGIBLE POINT ON THE OHIO RIVER.

"All which is respectfully submitted.

"PHILIP E. THOMAS,
"*Chm. of the Committee.*"

"The report being read and considered, was unanimously approved by the meeting. Whereupon it was, on motion,

"*Resolved*, That immediate application be made to the Legislature of Maryland, for an act incorporating a joint stock company, to be styled "The Baltimore and Ohio Railway Company," and clothing such company with all the powers necessary to the construction of a railroad, with two or more sets of rails, from the city of Baltimore to the Ohio river.

"*Resolved*, That the capital stock of said company shall be five millions of dollars, but that the company shall be incorporated, and provision shall be made by said act for its organization upon the subscription of one million of dollars to said stock; and that the said company shall have power to increase the capital stock thereof, so far as may be necessary to effect said objects.

"*Resolved*, That it is expedient and proper, in said act, to permit subscriptions of stock to the same to be made by the United States, by States, corporations, or individuals; and to provide that, as soon as the said act shall have been passed by the Legislature of Maryland, subscription books may be opened, subscriptions received, the company organised, and the said road constructed, so far as it may lie within the limits of the State of Maryland; and that the assent of the Legislatures of Pennsylvania and Virginia to the said act shall be obtained as speedily as possible, but shall be made necessary only so far as, in constructing the said road, it shall be found necessary to pass through their respective States.

"*Resolved*, That a committee, consisting of twenty-five members, be appointed by the chairman of this meeting, whose duty it shall be to prefer an application to the Legislature of Maryland for such an act of incorporation.

"The following committee was then appointed to carry into effect the object of the meeting, to wit: Charles Carroll, of Carrollton, William Patterson, Isaac M'Kim, Robert Oliver, Charles Ridgely, of Hampton, Thomas Tenant, Alexander Brown, John M'Kim, jun. Talbot Jones, James Wilson, Thomas Ellicott, George Hoffman, William Steuart, Philip E. Thomas, William Lorman, George Warner, Benj. C. Howard, Solomon Etting, W. W. Taylor, Alexander Fridge, James L. Hawkins, John B. Morris, Luke Tiernan, Alexander M'Donald, Solomon Birckhead.

"*Resolved*, That 1,500 copies of the foregoing report, and of the proceedings of this meeting, signed by the chairman and secretary, be published for circulation.

"The meeting then adjourned *sine die*.

"WILLIAM PATTERSON, *Chairman*.

"DAVID WINCHESTER, *Secretary*."

Then follow the annexed tables, viz:

TABLE No. 1.

Estimated difference in the distance between connecting the city of Baltimore with the western trade, by a continuous canal, intersecting the eastern termination of the proposed "Chesapeake and Ohio canal," within the District of Columbia, and of connecting Baltimore with this trade by a railway *direct* from that city to some suitable point on the Ohio river.

The United States' engineers report the length of the "Chesapeake and Ohio canal," from the city of Washington to Pittsburg, on the Ohio river, to be - - - - - -	341½ miles.
Estimated length of a canal from Baltimore, to intersect the "Chesapeake and Ohio canal" at Washington - - -	48½ miles.
Whole distance of a canal, by this route, from Baltimore to Pittsburg - - - - - - -	390 miles.
Estimated distance of a railroad from the city of Baltimore to Wheeling, or some other suitable point on the Ohio river	250 miles.
Distance saved by a railroad	140 miles.

TABLE No. 2.

Comparative cost of constructing a canal communication between the city of Baltimore and the Ohio river, by the proposed route of the "Chesapeake and Ohio canal," and by the proposed *direct* railroad communication between Baltimore and that river.

The United States' engineers estimate the cost of the proposed canal from Washington to Pittsburg to be ($22,375,427) twenty-two millions three hundred and seventy-five thousand four hundred and twenty-seven dollars; but we will suppose it could be made for one half of this sum, or - - - - - -	$11,000,000
To which should be added the cost of constructing a continuous canal from the city of Baltimore to the eastern termination of the "Chesapeake and Ohio canal" at Washington, that being the only point at which we can intersect it - - - - - -	1,000,000
	$12,000,000
The highest estimated cost of a railroad from Baltimore to the Ohio river, calculating the same to cost $20,000 per mile, (and this is believed to be a very high estimate) would be - - - - - -	5,000,000
Amount of capital saved in favor of a railroad - -	$7,000,000

TABLE No. 3.

Estimated difference of expense on transportation for tolls only, by the *proposed* canals from Baltimore through the District of Columbia to Pitts-

burg, and by a *direct* railroad route from Baltimore to some point on the Ohio river.

The United States' engineers estimate the cost of transportation by the proposed Chesapeake and Ohio canal at the rate of 1½ cents for each ton per mile. Taking the whole distance then from Baltimore to Pittsburg, as is shown in Table No. 1, to be 390 miles, the tolls for conveying a ton of freight from Baltimore, the whole distance along this canal, would be - - -	$5 85
Tolls for carrying the same freight along the proposed railroad at the same rate per mile, the distance being 250 miles, would be	3 75
Amount of freight saved per ton in favor of a railroad, at the same charge for tolls, would be - - - - - -	2 10
In order, however, to show the actual saving by the railroad, it is necessary to remark, that the proposed charge along it is not 1½ cents per ton each mile, as charged on the canal, but one cent per ton each mile, and this will give a further advantage in favor of the road, on each ton, of - - - -	1 25
Making the difference per ton in favor of the railroad to be -	$3 35

Table No. 4.

Estimate of the income which the proposed railroad from Baltimore to some point on the Ohio river would annually yield, computing the freight which would pass on this road to be only 150,000 tons from west to east, and the amount that would pass from east to west to be 50,000 tons.

150,000 tons from west to east, at 1 cent per ton per mile, being the New York canal price - - -	$375,000
50,000 tons from east to west, at 3 cents per ton per mile, being the New York canal price - - -	375,000
Total amount of tolls - -	$750,000

Table No. 5.

Estimate of profits to the holders of stock in the proposed Baltimore and Ohio railroad.

Expense of constructing the proposed road, being estimated at $20,000 per mile, and the distance being assumed to be 250 miles, would make the whole cost five millions of dollars - - - - - - -	$5,000,000
Six per cent. interest on the above capital invested would be	300,000
Income from tolls, as is shown by Table No. 4 - -	750,000
Which leaves $450,000 for repairs, contingent expenses, and surplus dividends - - - - - - -	$450,000

TABLE No. 6.

Estimated difference of the time it would take for conveying freight from Baltimore to Pittsburg by the proposed Chesapeake and Ohio canal, between those places, (through the District of Columbia) and by a *direct* railroad from Baltimore to some point on the Ohio river.

The United States' engineers estimate the time it will take to travel with loaded boats from Washington to Pittsburg to be - - - - - - - -	188 hours.
The distance between these points being 341 miles, we have only to add the same rate of travelling for the additional distance from Baltimore to Washington, say 48½ miles, and the additional time will be - - - -	26½ hours
Time employed in passing on the proposed canal, from Baltimore to Pittsburg - - - - - -	214½ hours.
There is abundant evidence to prove, from authentic documents published, that the rate of travelling upon railroads with the locomotive engines, in England, (and this has been sufficiently shown to be the cheapest means) is, with heavy loaded wagons, from 4 miles to 6 miles and even 8 miles per hour; assuming, however, the slowest rate, and the passage will be made from Baltimore to the Ohio river, say 250 miles, at the rate of 4 miles per hour, is	62½ hours.
Time saved in favor of the railroad, each trip - -	152 hours.

TABLE No. 7.

Synopsis of the six preceding tables.

Table 1.—Distance between Baltimore and Pittsburg, by the proposed Chesapeake and Ohio canal - -	390 miles.
Distance from Baltimore to the Ohio river by the proposed railroad - - - - -	250
Distance saved by the road	140 miles.
Table 2.—Smallest estimated cost of the proposed Chesapeake and Ohio canal - - - - - -	$12,000,000
Highest estimated cost of the contemplated railroad - - - - - -	5,000,000
Amount of capital saved in favor of the road	$7,000,000
Table 3.—Cost of transporting, for tolls only, on a ton of freight from Pittsburg to Baltimore, upon the Chesapeake and Ohio canal - - -	$5 85
Cost of same transportation by the proposed railroad - - - - - -	2 50
Tolls saved on each ton by the railroad	$3 45

Tables 4 *and* 5.—Annual income from tolls upon the proposed rail road - - - - -	$750,000
6 per cent. interest on the capital invested	300,000
Annual surplus profits, to be appropriated for repairs and extra dividends - -	$450,000

Table 6.—Time employed in passing a boat from Baltimore to Pittsburg, by the Chesapeake and Ohio canal	214½ hours.
Time to pass from Baltimore to the Ohio river upon the proposed rail road - - - - -	62½ hours.
Time saved by the road, each trip,	152 hours.

After the wide diffusion, by 1500 copies of this pamphlet, it cannot require other evidence of the total ignorance of the Chesapeake and Ohio canal convention, and their Central Committee, who met occasionally in Washington, of the danger which threatened their long labored enterprise from the new rival which had just sprung up.

But they had other manifestations from the patrons of this rival enterprise, which would have lulled the suspicion of such danger, had it existed.

The chairman of the Baltimore committee had been appointed, and had not declined acting as a commissioner, to open books for a subscription of stock to the Chesapeake and Ohio canal. Moreover, he, and several of his highly respectable associates in this rival enterprise, had been on the 6th, 7th, 8th, and 9th days of December, 1826, the acting representatives of the citizens of Baltimore, at the second assemblage of the Chesapeake and Ohio Canal Convention in the Capitol of the United States; the proceedings of which were conducted with unprecedented unanimity, and were marked by the following extraordinary occurrences—extraordinary, considering the proceedings above noticed of the same gentlemen, in the ensuing month of February of the same winter.

They manifest the perfect acquaintance of the founders of the Baltimore and Ohio railroad with the plan, route and estimate of the Chesapeake and Ohio canal, and were calculated to exclude the idea of any possible interference between the canal and railway.

Proceedings of the Chesapeake and Ohio Canal Convention, which assembled in the Capitol of the United States, in the City of Washington, on the 6th day of November, 1823, *and re-assembled in the same city on the sixth day of December,* 1826.

FIRST SESSION.

"THURSDAY, *the 6th day of November, A. D.* 1823.

"Delegates chosen by the people of various counties in the States of Virginia, Maryland, Pennsylvania, and Ohio, and by the several Corporations and other interests of the District of Columbia, assembled in the Capitol in the city of Washington, as a Convention, to take into consideration the practicability and expediency of uniting, by a canal navigation, the waters of the Chesapeake bay with those of the river Ohio; and to devise ways and means to effect that object."

The following are the resolutions as amended by the Committee, and finally passed by an unanimous vote of the Convention.

"Whereas a connexion of the Atlantic and western waters, by a canal leading from the seat of the General Government to the river Ohio, regarded as a local object, is one of the highest importance to the States immediately interested therein, and, considered in a national view, is of inestimable consequence to the future union, security, and happiness of the United States:

1. *Resolved, unanimously*, That it is expedient to substitute, for the present defective navigation of the Potomac river above tide water, a navigable canal by Cumberland to the mouth of Savage creek, at the eastern base of the Alleghany, and to extend such canal, as soon thereafter as practicable, to the highest constant steamboat navigation of the Monongahela or Ohio river.

That the most eligible mode of attaining this object will be by the incorporation of a joint stock company, empowered to cut the said canal through the territory of the United States in the District of Columbia, and of the States of Virginia, Maryland, and Pennsylvania; and, therefore, that committees be appointed, each consisting of five delegates, to prepare and present, in behalf of this Assembly, and in co-operation with the Central Committee hereinafter provided, suitable memorials to the Congress of the United States, and the Legislatures of the several States before named, requesting their concurrence in the incorporation of such a company, and their co-operation, if necessary, in the subscription of funds for the completion of the said canal.

And whereas, by an act of the General Assembly of Virginia, which passed the 22d February, 1823, entitled "An act incorporating the Potomac Canal Company," the assent of that State, so far as the limits of her territory render it necessary, is already given to this object—and for its enlargement, to the extent required by the preceding resolution, the said act appears to furnish, with proper amendments, a sufficient basis:

Be it therefore resolved, That it will be expedient to accept the same as a charter for the proposed company, with the following modifications, viz:

That, in reference to its enlarged purpose, the name be changed to "The Chesapeake and Ohio Canal:"

That provision be made for the assent of the Government of the United States, and of the State of Pennsylvania, to the said act, and that the act be made to correspond in its details with such provision:

That the Chesapeake and Ohio canal shall be divided into two sections, eastern and western; the former of which shall correspond in description with that of the Chesapeake and Ohio canal by the preceding resolution, and the latter shall begin at the western extremity of the former, and terminate at the head of the steamboat navigation of the Monongahela or Ohio river:

That while the act shall allow a reasonable time for the commencement and the completion of both sections of the canal, no other forfeiture shall be incurred, after the eastern section is finished, for a failure to begin or complete the western section, within the term prescribed, except of the right to complete such section, and of all interest therein:

That, while the consent of Pennsylvania is provided for, in the amended act, it shall not be indispensably requisite to the validity of the charter, so far as respects the authority granted by it, to extend the Chesapeake and Ohio canal to the Pennsylvania line:

That, it will be both just and expedient, if not absolutely necessary, to limit the interest of the stockholders of the Potomac Company, in the stock of the Chesapeake and Ohio canal, in the mode provided by the unanimous resolution of the company of the 7th day of February last, a copy of which is hereto annexed:

That the said canal shall not, in width, be less, at the surface than 40 feet, at its bottom than 28, nor its depth of water be short of four feet, except where, from the nature of the ground, it may be necessary for the greater security of the banks of the canal, to reduce its breadth at its base to less than 28 feet:

That the maximum profit of the said company shall not exceed 15 per cent. after the entire canal shall have been completed; but if, at any time after the completion of the eastern section thereof, and before sufficient funds shall have been otherwise provided for the completion of the western, the tolls of the canal shall yield a nett income to the stockholders exceeding 10 per cent. per annum, such excess shall be applied towards the extension of the canal until the western section shall have been completed; and to give more speedy effect to this provision, the President and Directors of the Chesapeake and Ohio Canal Company shall be authorized to borrow, or may negotiate, through a suitable agency, in behalf of the company, on the credit of such excess, or on the tolls, or a fixed part thereof, levied upon certain commodities passing through the said canal, being the probable amount of such annual excess, such sums of money as may be deemed expedient, by a general meeting of the stockholders, to be applied to the extension of the western section of the canal, from time to time, till the said section shall have been completed. And if, after the completion of the entire canal, the nett dividends shall exceed 15 per cent. per annum, such excess shall be applied, first, to strengthening the works of the canal; next, to the multiplication of ascending locks from the river Potomac to the level of the canal, wherever the convenience of the adjacent country may require it; next, to lining the canal throughout with such walls of stone as shall accommodate its banks to the use of steamboats; and should the nett dividends still exceed 15 per cent. then such excess shall be applied to the reduction of the tolls upon the said canal, according to some equitable scale.

The act aforesaid be amended, by inserting, in lieu of the 18th section thereof, the following:

"*And be it further enacted*, That the right to the waters of the river Potomac, for the purpose of any lateral canal or canals, which the State of Virginia or Maryland may authorize to be made, in connexion with the said canal, is reserved to the States respectively: That a similar right is reserved to the State of Pennsylvania, in relation to the rivers and streams within the territory of that State, the waters of which may be used in supplying the western section of the said canal: That the Government of the United States shall retain the power to extend the said canal or through the District of Columbia, on either or both sides of the river Potomac. And the State of Maryland or Virginia shall be empowered, under the sanction given by the United States to this act, to authorize any such extension, for the purpose of meeting any canal, so extended, by any other canal, which either State deem it expedient to conduct, in any direction whatever, through its territory.

" *Provided, however*, That no part of the waters of the river Potomac, or of any other river or stream, required to ensure the constant, safe, and con-

venient use of the navigation of the canal hereby authorized to be made, shall be, by any such lateral or continued canal, diverted therefrom, to the impediment or injury of the said navigation."

2. *And be it further resolved*, That, in addition to the provision contained in the first section of the act aforesaid, there be grounded on the event of its failure to furnish adequate funds for the completion of the eastern section of the canal, to be obtained through separate acts of the respective Governments and Corporations, of the States of Maryland and Virginia, of the United States, and of the three cities of the District of Columbia, a subscription to the amount, if necessary, of 2,750,000 dollars, in the following proportions: 2-11ths to be subscribed by the State of Maryland, 3-11ths by the State of Virginia, 4-11ths by the United States, and 2-11ths by the District cities, to be divided between them, according to an equitable ratio, to be fixed by themselves. In case a part of the sum aforesaid shall be subscribed by private individuals, in the mode provided by the act aforesaid, the several States and Corporations, within which such individual subscriptions are received, shall be requested to assume, as part of their aforesaid quotas, the amount of such subscription, under such security as they may deem expedient for the payment thereof, by the subscribers, to them respectively:

That the Government of the United States be earnestly solicited to obtain the whole of this sum on loan, receivable in four annual instalments, upon the issue of certificates of stock, bearing an annual interest not exceeding five per cent. and irredeemable for thirty years, and to guaranty the repayment thereof on a specific pledge of the public lots in the city of Washington, of the United States' stock in the canal, and the public faith:

That the first instalment of the loan be made payable on the 1st of March, 1825, and the last on the 1st of March, 1829:

That the interest of each State and Corporation, upon its proportion of the said loan, be paid into the Treasury of the United States, according to the terms of the loan, and the principal sum at the expiration of thirty years, the period to be fixed for its redemption:

That, in the event of a refusal by the Government of the United States, to negotiate the said loan, each State and Corporation shall provide the amount of its respective subscription, in such manner as may seem to it best.

3. *And be it further resolved*, That a committee of five delegates be appointed to prepare, and cause to be presented, in behalf of this Convention, a suitable memorial to the State of Ohio, soliciting the co-operation of that State in the completion of the Chesapeake and Ohio canal, and its ultimate connexion with the navigation of lake Erie; and that, for the latter purpose, the memorial shall respectfully suggest the expediency of causing the country, between the northernmost bend of the river Ohio and the southern shore of lake Erie, together with the waters of Great Beaver and Cayuga creeks, and all other intervening waters near the said route, to be carefully surveyed, with a view of ascertaining the practicability and probable cost of a canal, which, fed by the latter, shall connect the former:

That a letter be addressed by the Chairman of the Convention to the Mayors of Alexandria, Georgetown, and Washington, apprizing, through them, their respective Corporations of the proceedings of this Convention, and inviting their zealous co-operation in giving to them effect:

That another letter be addressed by the Chairman, in behalf of this Convention, to the President and Directors of the Potomac Company, request-

ing their concurrence in the measures recommended by the preceding resolutions.

4. *And be it further resolved*, That the committee before named be, and they are hereby, authorized, and requested to use their best exertions to obtain the most favorable reception for their memorials, to ascertain and communicate to the Central Corresponding Committee hereinafter named, such objections, if any, as are opposed to the prayers of their respective memorials, and to devise, if possible, in conjunction with the common friends of the union and prosperity of the United States, the means of obviating all the impediments to their success.

5. *And be it further resolved*, That, for the last mentioned purpose, the delegates of the respective counties and Corporations, represented in this Convention, be regarded also as Corresponding Committees, and that thirteen delegates be appointed a Central Committee of Correspondence, to confer with the committees before named, and to hold stated meetings in the city of Washington, for the purpose of consulting upon, and adopting in behalf of, the Chesapeake and Ohio canal, such measures as may seem best calculated to assure its certain and speedy completion.

JOSEPH KENT, *Chairman.*

WALTER JONES, *Secretary.*"

The following Committees were appointed by the Chairman.

Central Committee.—Charles F. Mercer, John Mason, Walter Jones, Thomas Swann, John M'Lean, William H. Fitzhugh, H. L. Opie, Alfred H. Powell, P. C. Pendleton, A. Fenwick, John Lee, Frisby Tilghman, Robert W. Bowie.

Committee for Virginia.—Philip C. Pendleton, H. L. Opie, J. C. Hunter, W. Ellsey, Nathan Burwell.

Committee for Pennsylvania.—James Shriver, James Shannon, John M'Mahon, Daniel Kincheloe, George Hagan.

Committee for Maryland.—Grafton Duvall, George Mason, of Charles county, T. Kenedy, J. C. Herbert, Gen. James Forrest.

To memorialize Congress.—Walter Jones, John Mason, G. W. P. Custis, Robert I. Taylor, Samuel H. Smith.

Committee for Ohio.—John M'Lean, Walter Smith, Benjamin S. Forrest, Thomas Carbery, H. Peake.

A charter having been obtained, surveys and a location of the canal made, with an estimate of its cost, to revise that estimate the Convention were called together at the instance of their Central Committee, and by the request of the commissioners appointed by the United States and the States of Maryland and Virginia, to receive subscriptions of stock to the Chesapeake and Ohio canal, preparatory to the opening of the books of subscription.

Accordingly the Convention re-assembled on Wednesday the 6th of December, 1826. The following are extracts from the printed journal of their proceedings:

"PROCEEDINGS OF THE CONVENTION—SECOND SESSION.

"WEDNESDAY, *6th December*, 1826.

"The Chesapeake and Ohio Canal Convention assembled, agreeably to adjournment and to public invitation, this day, at 12 o'clock. The chair was resumed by Governor KENT, and WALTER JONES continued to act as Secretary.

Mr. Powell nominated Jas. S. Crafts, of Pittsburg, as assistant Secretary, and he was unanimously appointed to, and accepted that office.

It was then stated that those who had acted as delegates at the former session of the Convention, would be considered members of the present, and those who had not, were requested to hand in their names, and verify their powers.

The following is the roll of the delegates to the former, as well as the present session of the Convention.

Among the members present, who, on being called, answered to their names, were the following from the city of Baltimore, viz: Solomon Etting, Benjamin C. Howard, William Lorman, Isaac McKim, Joseph W. Patterson, and Philip E. Thomas; the last named being one of the commissioners appointed by the Governor and Council of Maryland to receive subscriptions to the stock of the canal.

Of the Baltimore delegation, the following gentlemen did not attend, viz: Thomas Ellicott, Roger B. Taney, and Luke Tiernan.

On Thursday the 7th of December, being the second day of the session of the Convention,

Mr. McKim, of Baltimore, offered the following resolution:

Resolved, As the sense of this Convention, that the interests of the extensive district of country upon the route of the contemplated Chesapeake and Ohio canal render it highly proper that a continuous canal navigation should be provided from some point upon the line or at the termination of said canal, to the city of Baltimore:

And whereas doubts may exist whether the acts of legislation now in force have fully provided for the attainment of that desirable object—Therefore,

Resolved, That the committee heretofore appointed for the purpose of inquiring whether any, and what alterations are necessary in the various laws relative to the canal, be, and they are hereby, specially instructed to inquire whether any, and what, further acts of legislation are necessary for the security of the object stated in the preceding resolution.

The resolution was agreed to."

"Friday, *December* 8.

"Mr. Foster, of Pennsylvania, from the committee appointed to examine the laws of the different States passed in relation to the canal, made the following report:

"The committee to whom was referred the resolution—That a committee of four delegates from each of the States of Virginia, Maryland, Pennsylvania, and Ohio, and the District of Columbia, be appointed to examine the different legislative acts that have been passed relative to the Chesapeake and Ohio canal, and report whether any, and if so what additions, alterations, or amendments, may be necessary in said laws, and what further provision should be made, in order to carry into complete effect the objects of the Convention:

Also, to inquire and report whether any, and what further acts of legislation are necessary for the security of a continuous canal navigation from some point upon the line or at the termination of the Chesapeake and Ohio cana, to the city of Baltimore, respectfully report:

That although it be possible that some amendments might be beneficially made in the charter, and that it may require some further revision, yet the committee does not perceive in any of the proposed subjects of amendment

(except that recommended in the first resolution reported from the Central Committee,) any necessity for immediate legislation or memorial; but that the same may be postponed without detriment or inconvenience.

The committee therefore recommend, that all proposals for any change or amendment in the charter, be, for the present, limited to the one proposed in the said resolution of the Central Committee.

The committee is not aware of any specific provision necessary to be made beyond the existing provisions of the charter, for a lateral canal to Baltimore; but has entire confidence that all which good faith and justice require to be done, in order to give effect to the existing provisions of the charter in favor of such canal, will, when the occasion shall arrive, be done by the proper legislative authority."

Mr. Foster accompanied the report by some observations, in which he stated briefly the reasons which had induced the committee to come to the conclusion they had stated, in relation to the lateral canal to Baltimore.

Mr. Howard, of Baltimore, then offered a resolution to amend the report, by striking out so much as related to that subject, with a view to insert the following substitute:

Resolved, That Congress be requested to enact a law expressly securing to the State of Maryland, and to any company to be incorporated by the said State, the right to take and continue a canal from any point of the Chesapeake and Ohio canal through the territory of Columbia, or any part thereof, to the said State, in any direction it may think proper; upon the same terms and conditions, and with all the rights, privileges, and powers, of every kind whatever, granted to the Chesapeake and Ohio Canal Company, by the act of incorporation, in case it should be determined by Congress that such connexion can be made without impediment or injury to the navigation of the Chesapeake and Ohio canal.

This motion gave rise to an able and interesting legal discussion on the interpretation of an act of Congress, confirming the charter of the canal company; in which Messrs. Howard, of Baltimore, Nelson, of Fredericktown, Mercer, of Virginia, Jones, of Washington city, Pigman, of Maryland, Foster, of Pennsylvania, Clay, Maxcy, of Maryland, and Powell, of Virginia, took part; which resulted in the rejection of Mr. Howard's proposition to strike out, by a large majority.

Mr. Reed, of Carlisle, Pa., then moved that the report be amended by adding thereto the following clause:

But, while the Convention makes this candid expression of opinion in reference to the necessity of any change in the laws of the United States, securing to Maryland the right of constructing a canal through the territory of Columbia, yet, from a respect which is due to doubts entertained in the State of Maryland, with regard to the want of precision in the terms of the act of Congress, in relation to the guarantee, the Central Committee, or other committee of this Convention, to which may be committed the duty of presenting any memorial to Congress on the subject of the Chesapeake and Ohio canal, is instructed to insert a clause in such memorial, respectfully requesting of Congress to pass a declaratory act, expressly securing the right claimed by Maryland, upon the terms and conditions prescribed by the second section of the act of Congress of the 3d of March, 1825, confirming the acts of the Legislatures of Virginia, Maryland, and Pennsylvania.

After some remarks and explanations by Mr. Mason, of Georgetown, and Mr. Lee, of Montgomery, in relation to the last law of Maryland above re-

ferred to, the amendment offered by Mr. Reed was unanimously agreed to, and the report adopted.

SATURDAY, *December* 9.

The remaining resolutions recommended by the Central Committee, were taken up; and, the following being under consideration:

Resolved, That it will be expedient to obtain such an amendment of the charter of the Chesapeake and Ohio Canal Company, as shall authorize the Company to terminate, if they deem proper, the eastern section of said canal, at or near the town of Cumberland; and to extend, by any route therefrom, the western section of the said canal across the Alleghany to Pittsburg, or, to substitute therefor a railway. And, in the event that such a change shall be deemed expedient, in the route now prescribed by the charter, to defer the extension of a canal along the Potomac, from Cumberland to the mouth of Savage, and to reduce the dimensions thereof to a breadth less than that now required.

Mr. Kennedy moved to strike out the words "*or to substitute therefor a railway.*"

Mr. Key moved to add "or such other mode of transportation as they may find expedient."

Mr. Kennedy's motion was negatived.

The resolution was adopted by adding to the first resolution of the Central Committee, after the word "railway," or turnpike road on that portion of the route, or any part thereof, designated in the report of the Board of Internal Improvement, of the 23d October, 1826, as the middle section, or on that part of the route by Savage which corresponds therewith.

The second resolution of the Central Committee, in the following words, was taken up:

Resolved, That it will be expedient to address a memorial to the Congress of the United States, requesting a subscription to the stock of the said canal, and a like memorial to the Legislatures of Virginia, Maryland, and Pennsylvania; and that an application be made to the cities of Washington, Georgetown, and Alexandria, to aid, by a similar subscription, the stock of the said Company.

On motion of Mr. Etting, the word "Baltimore" was added, after the word "Alexandria," in the foregoing resolution."

The preceding facts have long made part of the reports of committees, or of public memorials addressed to Congress.

A commentary upon them, and other facts of like notoriety, is hereto subjoined, from a report of the General Committee of the stockholders of the Chesapeake and Ohio canal to the general meeting of the Company, on the 3d of December, 1831.

In the year 1784, the Potomac Company was incorporated, with a view to extend the navigation of the river, whose name it bears, "from tide water to the highest place practicable on the North Branch;" and it was countenanced by warm legislative and individual support, in the States of Maryland and Virginia. Very extensive powers were confided to this Company, over the principal river as well as its subsidiary streams, all which are now vested in the Chesapeake and Ohio Canal Company; and the mode in which

the projected improvements were to be accomplished are, in the charter, stated to be, by canals and other works. After a protracted existence, and an exhaustion of its funds, the great objects of the creation of this Company were but imperfectly accomplished; and the growing capacities of the country, as well as the general stimulus afforded to great enterprises of internal improvement, again awakened public attention to the original project, of connecting the western waters with those of the Chesapeake. Conventions were held, to deliberate upon the subject, in the city of Washington, and numerous delegates from Maryland, including some now most conspicuous for their zeal against the enterprise, acted in conjunction with others, from Virginia, Pennsylvania, Ohio, and the District of Columbia, and were apparently equally interested in the comtemplated improvement.

The advantages which must result from a successful prosecution of the project were apparent to all, and afforded no ground for a diversity of opinion. Those who were more especially active in the business, found but a single ground to which their enquiries were to be confined; they were to ascertain the practicability of the project—in which term is comprehended, the expense which would attend its completion. Four several surveys of the ground, lying between the tide waters of the Potomac, in the District of Columbia, and the Ohio river, were made, by skilful engineers, at the instance of the States of Virginia and Maryland, and of the United States. These various surveys and examinations satisfied the minds of those favorable to the contemplated work, that it might be accomplished, and at a reasonable price.

A charter having been obtained, from Virginia, in January, 1824, confirmed by Maryland, January, 1825, by Congress, March, 1825, and by Pennsylvania, February, 1826, and the necessary preliminary surveys and estimates having been completed, books were opened by commissioners, duly appointed by these high authorities, for the purpose of receiving subscriptions to the stock of the Company, for making the eastern section of the canal. The official returns of these commissioners show that, as early as November, 1827, a sufficient sum had been subscribed, to comply with the provisions of the third section of the charter, which enacts that, "whenever one-fourth, or a greater part of the said stock shall have been subscribed in the manner aforesaid, then the subscribers, their heirs, and assigns, shall be, and are hereby declared to be, incorporated into a company, by the name of the Chesapeake and Ohio Canal Company." This corporation had thus been created, its charters had been granted, and the subscriptions made, in the confidence that the canal would be constructed on the ground which had been previously surveyed for this especial purpose, and from which surveys, alone, all the estimates had been made, both of the feasibility of the contemplated work, and its consequent expense.

The rival company originated in a public meeting, held at Baltimore, in February, 1827. A committee, to whom the subject was referred, made a report, which was unanimously adopted, and which served as the basis of an application to the Legislature of Maryland for a charter. This report was made with a particular reference to the surveys and estimates for the canal, it contrasts them with the conjectural estimates of the distance and cost of their own work, and, referring to a "direct railroad from Baltimore to some eligible point on the Ohio river," institutes a comparison between the two, highly favorable to their own project. The distance to be saved by the railroad, was to be one hundred and forty miles; the expense to be saved, was seven millions of dollars.

Such was the scheme which the Legislature of Maryland was asked to sanction; such the representations and assurances held out to that body, to induce a compliance with the wishes of the meeting at Baltimore. In accordance with these wishes, a charter was obtained, within the brief period of ten days from the date of the report, and the Railroad Company became incorporated. Until the spring of 1828, however, no intimation had been given, and no apprehensions existed on the part of the Canal Company, of any other collision or interference between the two projects, than such as might arise from a fair, and free, and honorable competition. The first annunciation of such a collision appeared in May, 1828.

It becomes important, at this stage, to draw the particular attention of the stockholders to the dates of events which were now about to transpire. On the 24th of May, 1828, the act of Congress, authorizing a subscription of one million of dollars to the Chesapeake and Ohio canal, received the signature of the President, and became a law. It is scarcely necessary to remark, that it generally occurs that the ultimate fate of an important bill may be predicted, with the utmost confidence, some time before its final passage; and that, in relation to this act, in particular, it was well ascertained that it would be sanctioned by the Legislature.

On the 5th of May, 1828, a report was made from the board of engineers of the Railroad Company, containing a recommendation, which induced the selection of the valley of the Potomac for the route of the projected work. In consequence of this report, which professes to be formed upon an examination of the country between Baltimore and the Conococheague creek, executed in compliance with a resolution which had been passed but eleven days previously, the company resolved upon selecting, for the general site of the railroad, the valley of the Potomac, from the Point of Rocks to Cumberland. This determination, as was obvious, threatened to involve the two companies in direct conflict, throughout this entire distance. The report of the engineers "was laid before the board of directors on the 8th, [May] and, on the 9th, the advice of eminent counsel was asked as to the course which the Railroad Company should pursue, to take possession of, and hold, the track it might desire for the location of the road. The company was advised that titles to the site of the road required, by purchase or condemnation, in the manner prescribed by the charter, would be valid against all subsequent claimants, whether corporate or individual; and, in consequence of such advice, agents were appointed, on the 12th, who proceeded along the proposed route, and, according to the exigency of the case, contracted for, or commenced process of condemnation of, such portions of the site of the road as were actually desired, and located by metes and bounds, by the engineers of the company."*

The circumstances developed in the preceding extract from an official publication by the Railroad Company, themselves, justified the suspicion that the examination which took place, and which induced these proceedings, could not have been very minute or scientific in its character, but that other data existed, which led the skilful engineers who recommended the route in question to sanction the choice. This suspicion has been corroborated by the examination of Colonel Long, the principal engineer, in the legal controversy to which these measures gave rise; and the committee is assured that the testimony of that gentleman clearly establishes that the exa-

* Report of the directors of the Baltimore and Ohio Railroad Company to the Legislature of Maryland, page 9.

mination, made by himself and his associate, Mr. Knight, was a rapid one, on horseback, from Baltimore to Williamsport, and from Williamsport to Fredericktown, which extended along the selected track only between Harper's Ferry and the Point of Rocks. From the same authentic source it is further made to appear, that, on the 5th of May, when the report in question was made, no survey had been made by or on behalf of the Railroad Company, along the margin of the Potomac, over any part of the ground in controversy, which could justify a scientific man in recommending it as the most eligible, or even as a practicable route, for such a work; but that the principal, if not the only precise data upon which such a judgment could be, and actually was formed, were the surveys made for the specific use of the Chesapeake and Ohio canal. That the opinions of counsel were taken with a distinct view of the conflict with this company, and that the proceedings above mentioned were designed to prepare for such a contest, cannot admit of a reasonable doubt.

What was the ground which it was deemed essential forthwith to secure for the track of the railroad, and was actually defined and located by metes and bounds, will distinctly appear from the following extract from the minutes of the board of engineers, and from the instructions issued to the individuals designated to carry the wishes and designs of the directors into effect:

"*At a meeting of the Board of Engineers, 12th May*, 1828. *Present, Col.* Long, *and* P. E. Thomas.

"The President stated that he had been authorized and instructed, by the directors of the Baltimore and Ohio Railroad Company, to take measures for the location of the road along the east bank of the river Potomac, commencing at the Point of Rocks, about seven miles west from the mouth of the Monocacy, and thence, as far as Cumberland; and that it was desirable, in the first instance, to secure for the company the occupancy and possession of such sections, within those limits, as are deemed indispensable to the advantageous location of the road: Whereupon, resolved, that the necessary surveys be forthwith made; and, in order to fully effectuate the object of the company, the following instructions be given to Col. Long and Capt. McNeill, who are desired to proceed immediately to the execution thereof.

"Agreeably to a resolution of the board of engineers of the Baltimore and Ohio Railroad Company, dated on the 12th May, 1828, directing a survey of certain tracts or parcels of land, situate on the northeastern bank of the Potomac river, with a view to a partial location of the railroad, the following surveys and location will forthwith be made, to wit: commencing on the eastern shore of the Potomac river, about ten perches below the point denominated the Point of Rocks, and running upward, along the margin of the river, in such a manner and direction as to pass said Point of Rocks, and all other similar precipices, and all abrupt river hills or bluffs, between the bases of which, and the margin of extreme low water, the space or bottom does not exceed two hundred feet in width. The surveys to be continued along said northeastern shore, at all such places and points as herein before first designated, from the place of beginning to Cumberland, in Alleghany county, except at such points as will admit of a judicious and beneficial location, more or less remote from the valley of the Potomac.

"The dimensions of the aforesaid tracts or parcels, and their localities, when surveyed, will be as follows: In all situations where the space between the bases of the bluffs, or precipices, and the margin of extreme low water, does not exceed 66 feet, a line will be run along such base, or the slope, or the summit of the hill or precipices above it, at the distance of 66 feet, as above stated, from the margin of low water, measured horizontally, in a direction, as nearly as may be, perpendicular to the course of the river in its immediate vicinity. In all situations where the space, as above, has a greater width than 66 feet, and less than 200 feet, the tract to be surveyed (which must be, as before, 66 feet wide) will be carefully selected with a particular view to embrace the greatest facilities for the construction of the road, and for placing it beyond the reach of the highest freshets."*

In pursuance of these instructions, Col. Long and Capt. M'Neill proceeded to execute the duty entrusted to them, each accompanied by one of the professional counsel of the company; and with such alacrity did they perform their labors, that the surveys, as directed, were nearly, if not completed, upon the entire route from the Point of Rocks to Cumberland, before the Canal Company could procure and serve its injunction to stay their progress, in the following month.

From the foregoing, and other facts of equal notoriety, the committee believe that, whatever may be the legal rights of the parties, now deferred to a judicial decision, it must, at least, be obvious, that the Canal Company has been harshly dealt with. This company was formed and organized, and subscriptions made to its stock, for the purpose of carrying into execution a precise and well defined object—to construct a canal, upon ground which had been surveyed and located for that especial purpose, and after having ascertained, as nearly as was practicable, the expense to which the completion of it, as far as the coal banks, beyond Cumberland, would subject the parties. The Railroad Company, at the date of its charter, and at the period of its organization, seems to have had no definite plan of operations, but, holding out to the Legislature of the State, and to the community, a vague project of a direct route from Baltimore to the Ohio, with a great advantage over the canal, both as to distance and expense, procured, upon the faith of these assurances, a charter of incorporation from the one, and a large subscription from the other. By the terms of the act of incorporation of the Canal Company, the necessary subscriptions were made, and the company incorporated, before the Railroad Company had indicated any intention or desire to appropriate, to its own purposes, the ground in controversy. A confident expectation was entertained, approaching almost to an absolute certainty, that the United States were about to subscribe a million of dollars to the work, which would ensure an immediate commencement and vigorous prosecution of the enterprise. Before any public movement was made, threatening a collision, at that critical and interesting juncture; without having themselves made a single survey, with a view to ascertain its fitness for their purpose, but relying upon the accuracy of the surveys made exclusively for the canal; without having taken the necessary means to determine whether another and more eligible route was not open for their selection, a determination was made, but kept secret from the public, to abandon the project of a direct route to the Ohio; to surrender the magnificent promise of shortening the distance one hundred and forty miles; and to appropriate

* Colonel Long and Captain McNeill's narrative.

to their own exclusive use the ground which had been located, and the tedious and expensive surveys which had been made, for the rival enterprise. The proceedings in execution of this determination were conducted with equal secrecy and despatch; and should they be adjudged, finally, to have been operative to confer upon the Railroad Company the advantages which it has sought to acquire, we can have no cause for self-reproach, unless it be criminal not to indulge suspicions, which, had they proved groundless, might justly have been deemed most disparaging and offensive.

Under the circumstances which have been detailed, the committee are of opinion that no censure could properly have attached to the body to which they belong, had its President and Directors indignantly rejected all communications of an amicable kind with its opponent. But, though much was known, and more suspected, the full proof of all the foregoing facts has not been procured until recently, and that proof yet remains uncontradicted and without denial.

Upon the subject of the compromise between the two companies, the committee, after all the investigation which they have given to it, entertain the decided opinion that no terms have been offered to the Canal Company, the acceptance of which would not have involved an expenditure of time and money, and the incurring of dangers, nearly equivalent to total ruin. In this opinion the committee have been confirmed by the statements made by Col. Abert, Judge Roberts, and Mr. Cruger, upon whose judgment, in matters of science and professional skill, we are disposed to place great confidence. The same investigation has induced the belief, on the part of the committee, that, in the conduct of this business, every spirit of accommodation has been exhibited by the canal board, which a due regard to the interests they represent would permit.

The committee cannot close their remarks upon the subject of this unhappy and vexatious contest, without expressing their earnest desire and hope that it may be speedily and for ever terminated by a final judicial cision. Such a desire they believe to be universal on the part of those whom they represent; and they have been satisfactorily assured that, as soon as the evidence in the case was closed, an offer was made to the opposite party, through its counsel, to give to it, without argument or delay, the same decree which has been recently granted by the chancellor of Maryland. This offer was made for the purpose of avoiding unnecessary delay and useless expense, and was again renewed immediately before the last hearing of the case. The committee will forbear to assign any reasons for its rejection, which, however well grounded they may be, are, nevertheless, but conjectures.

The repeated occasions on which the subject of this controversy has been brought before the public; the disingenuous statements which have been made in relation to it; the imposing manner in which these misrepresentations have been promulgated; and the misapprehensions as to its origin and character, to which they have given birth and strength, have induced the committee, with unfeigned reluctance, to enter into the preceding detail. They have, however, endeavored, faithfully, to discharge a duty which they felt due to themselves, to the company of which they are members, and to the President and Directors, to whom the management of interests so important are entrusted.

A compromise of the dispute between the two companies, as far as from the Point of Rocks to Harper's Ferry, was tendered, in presence of a committee of the Senate, by the President of the Baltimore and Ohio Railroad Company to the President of the Canal Company. In a private interview between them it was extended up the Potomac to 100 miles from Washington, at the town of Williamsport. It was accepted, to this extent, by the canal board, and confirmed by the President and Directors of the Railroad Company.

A survey and estimate were accordingly made, by engineers in the service of both companies, pursuant to this agreement, and a report by them, so far favorable to the compromise, was submitted to the two boards. It was approved by that of the Canal Company; but, when it was expected by them to proceed to the execution of the joint work, the President and Directors of the Railroad Company coupled with their assent, besides other conditions wholly inadmissible, one entirely new, "that the Canal Company should agree to extend the compromise to the entire route between the Point of Rocks and Cumberland.

The letters from Messrs. Roberts and Cruger, (both of whom were well acquainted with the shores of the Potomac above the Point of Rocks,) which will be seen in a preceding part of this appendix, at the end of the 3d annual report of the President and Directors to the stockholders of the Chesapeake and Ohio Canal Company, will shew why the former unanimously rejected the unexpected condition, attached by the President and Directors of the Baltimore and Ohio Railroad Company, to a compromise proposed by their President, and subsequently approved by themselves.

(O.)

The relative cost of the construction of railroads and canals, the comparative expense of transportation thereupon, and of their respective annual repairs.

It is believed that these interesting topics of inquiry have recently had new light shed upon them, by facts and authorities entitled to the highest confidence.

Some of these, with the conclusions to which they lead, have been already briefly noticed. Others are embodied in the following note, an apology for which, it is hoped, will be found in the intrinsic difficulty, novelty, and importance of the investigations which it undertakes, and the growing anxiety of the public to be correctly informed in relation to the various subjects which they necessarily involve.

In all cases where practicable, the language of the authorities cited will be found to be employed, with a view to ensure greater confidence in the conclusions at which the memorialists have arrived.

Extract from the report of the Board of Managers of the Lehigh Coal and Navigation Company, presented to the stockholders on the 12th of January, 1829:—

"The railroad continues an effective auxiliary to the business of the company, and, being located upon a plane, descending in the direction of the load, and requiring no expensive or complicated machinery in its use, ap-

proximates, in facility of transit, to *a small canal;* and, whenever an enlarged business shall require the construction of another track, the peculiar advantages presenting for its location will insure its effects to be fully commensurate with the most extended prospects of trade. The report of the engineer will exhibit the progress of the improvements on the Lehigh, and what still remains to be done; from which it will appear that the whole can be completed in the early part of next season; and will then furnish a navigation from Mauch Chunk to Easton, made up of thirty-seven miles of canal and ten miles of slack water pools, having five feet depth of water, and a well constructed towing path the whole distance. The canals are sixty feet in width on the top water line, with locks twenty-two feet wide and one hundred feet long, and fed, at eight separate points, by substantial dams across the river. These, besides furnishing an ample supply of water for all the purposes of navigation, will also afford important water power in advantageous positions, especially the one at Easton, which has already begun even to attract the attention of manufacturers."

To the annual report, from which the preceding extract is made, is appended the following report of the acting manager, Josiah White:

'That the railroad to the company's mines, notwithstanding it was put up in such an expeditious manner, and was the first made, of such a magnitude, in our country, continues to answer the desired purpose, although it has been subject to some modifications and alterations. Since we have reduced the velocity of travelling, from *twelve to fifteen miles* an hour, down to *five and seven miles an hour*, our horses and mules, which in the former rate, got and kept sick in the latter continue healthy, notwithstanding their regular daily work is thirty-five to forty-five miles per day; and, so so strong is their attachment to riding down, that, in one instance, when they were sent up with the coal wagons, without their mule wagons, the hands could not drive them down, and were under the necessity of drawing up heir wagons for the animals to ride in."

" Perhaps some remarks on our experience with our railroad, on which has been transported upwards of 60,000 tons, may settle the question with some of our stockholders, who have doubted the policy of canalling the valley of the Lehigh, in place of making a railroad. I, therefore, now give the cost of transportation on our railroad, and also on the Erie canal. Data, for the latter, I obtained from the superintendent of the east division of the Erie canal, and also from a gentleman largely engaged, for three years, in the making of hydraulic lime or cement, and transporting it on one hundred and fifty-two miles of this canal. Both are given, without tolls, or repairs of road or canal.

" *Cost of transportation on our railroad, for the year* 1828.

Mules and horses cost - -	1 1–3	cent per ton	per mile.
Hands - - - - -	1 1–3	do.	do.
Repairing wagons - - -	2–3	do.	do.
Oil for do. - - -	1–5	do.	do.
Total - - - - -	3 53 00	do.	per ton a mile,

full and one way, and the whole cost divided into the distance one way only.

Cost of transportation on the Erie Canal.

"For boats of forty tons burthen, one cent per ton a mile: full loads one way, and returning empty. Calculated as per the railroad.

"Calculating on same data as above, on a boat of sixty-seven tons, such as will be adapted to the Delaware canal, will cost seven-tenths of a cent per ton a mile: and for a boat of one hundred and thirty-four tons burthen, adapted to the Lehigh canal, one-half cent per ton a mile; the latter being less than one-sixth the cost per mile, as per our railroad, notwithstanding the favorable circumstances attending that railroad.

"A railroad, well made, is attended with little expense for repairs and decay at first; but all its essential parts begin, though slightly, to decay at its existence, and its decay gradually increases to its final annihilation.

"A canal is attended with expensive breaches, &c. in the first instance, but every repair makes the work better; and most of its constituent parts are as durable as time.

"Our canal, it is believed by our engineer, will be passable by the seventh month (July) next. It is calculated for boats of one hundred and thirty to one hundred and fifty tons burthen. All the locks, aqueducts, culverts, &c. are laid in hydraulic lime. The ponds connecting the canal are cleared out in the channel fifty feet in width, and five feet deep: and all the tow paths along them are faced with a permanent slope wall. In the whole line, I know of no part on which money is expended for ornament; but, inasmuch as we were sure of a large transportation on it, money has been expended to make it substantial, that might have been avoided, if the desire had been more to come within the original estimate of the engineer, than to have made a substantial and permanent work.

"In the dryest weather of last autumn, our engineer, Canvas White, was on the summit between the Nescopeck and Lehigh, and, at the Lehigh, where it was proposed to take the water out for the supply of the canal to Nescopeck and the Susquehannah; and his opinion was given, that there is an abundant supply of water for the summit; and, since then, Mr. Robinson, a skilful engineer, appointed by the State commissioners to examine those grounds, for a canal or railroad from the head waters of Schuylkill and Lehigh, or Broadhead creek, to the river Susquehannah, has examined those grounds; and I learn that the result of his examination is, that, of all the lines proposed, *there is but one* adapted for a canal navigation, and that one is by the Nescopeck to the Lehigh; and here, by resorting to a tunnel of only one hundred and seventy-five poles in length, and a dam only ten to thirteen feet in height across the Lehigh, at the mouth of Bear creek, the river Lehigh will flow into the summit. When it is recollected that it is the *only* line for a water communication north of the Blue mountains, that can connect the Susquehannah with the Delaware and Philadelphia, and that the produce of the *west branch* of the Susquehannah can get as cheaply this way as any other, and *all* on the north branch of the Susquehannah, cheaper to Philadelphia, and thus be tributary to the Lehigh Canal, and the Delaware division of the State canal, the stockholders of this company, and the public at large, will know, ere long, how to appreciate it. The Nescopeck and Lehigh canal is calculated to correspond with the Delaware section, for boats of sixty-seven tons burthen, *and will cost for transportation from Berwick to Mauch Chunk*, from the best data I can get, *about one-third as much per ton a mile as on our railroad;* this, added to the advantages

of a *continuous voyage in the same boat,* and with the *same superintending hands,* (and *no trans-shipment,*) from the extreme ends of the Susquehannah canal, to Philadelphia, will, I presume, settle public opinion on the manner of passing the ridge of land between the waters of the Susquehannah and the Delaware.

"All which is respectfully submitted.

JOSIAH WHITE, *Acting Manager.*"

Philadelphia, 1st mo. 12th, 1829.

Extracts from the report of the Board of Managers of the Lehigh Coal and Navigation Company, for the year 1830, *and the Acting Manager's report.*

"The length of our line of improvement is 46¾ miles, and has cost, including the whole of the river improvement, from its commencement as a descending navigation, to its final completion, about $1,558,000; the distance being divided into 36¾ miles of canal, and 10 miles of pools, with a tow path throughout the line."

From the Acting Manager's report of 1829.

"We have made some very satisfactory alterations in the railway, for the purpose of preventing the early decay of the timber, and jolting of the wagons. We now run the wagons at the average rate of about six miles an hour, and find this motion produces much less wear, both of the wagons and road, than a greater velocity. I have demonstrated to my satisfaction, that the wear and tear of the road and wagons is in proportion to the motion; and that, in the end, a motion exceeding twenty miles an hour (whichwe tried in the first months of our business) will make the transportation on railroads more expensive, *than on our graded turnpike,* on which the rails were laid."

In addition to the information derived from the published documents and reports of the Lehigh Coal and Navigation Company, it is deemed proper to insert in this note the following essay in the Mauch Chunk Courier, from the pen of the highly respectable superintendent of that work, sustaining the views of the comparative advantages of railroads and canals which his official duty had prompted him to communicate to those in whose service he has long been engaged: and whose confidence, he is known, to have possessed, in an eminent degree.

To the Editor of the Mauch Chunk Courier.

A friend handed me, a day or two since, the "Paterson (N. J.) Intelligencer," dated 7th April, and called my attention to a long article, signed by John I. Sullivan, civil engineer, wherein I am made to appear the enemy of the public improvements now going on in our country. It would be a poor compliment to human nature for me to change at this time of day, after twenty years personal devotion to works of a public nature, and twice jeopardising my whole estate in promoting those improvements, and now take a contrary course.

We began our railroad early in January, 1827, and finished in May following. Up to this time, we transported on it more than 100,000 tons. Its entire length is nine miles, single tracks; its branches at the ends and side-

lings, four miles more. The elevation of the road, from the head to the chute to the summit, is 767 feet, in a distance of eight miles, being an average of ninety-six feet to the mile. We have not had a week's interruption from casualty since it was finished; so that it may be called a practical road from its completion. The first two months' use of the road, our wagons moved fifteen and twenty miles an hour, as the men who had charge of their descent were anxious to get through the route as soon as possible, to avoid the fatigue of holding them in check by the breaks. We soon perceived our utter inability to keep the wagons repaired without reducing the speed, or be subject to cost and repairs greater than the gains made over the good turnpike we had abandoned; besides, the tremulous motion occasioned by the wagons going at those rapid rates ground the corners of the coal into powder, which enveloped the driver in a continual cloud of dust.

Our railroad was new when we travelled at the high speed, and, although not so perfect as it might have been made, I presume it was as evenly made as those which are made more perfect in other respects, in the first instance, would be, after one years' wear and tear from 100,000 tons per year going on them, at the rate of 15 or 20 miles an hour. Thirty years ago, the railroads in England, and until very lately, had their flanges on the track of the road, or most of them in that way; and as a consequence, were always liable to be covered with dust, dirt, &c.: ours is of the modern construction, and we have adapted it to ride the horses down, so that they perform two ordinary days work in each day. The only difference between our road and the most modern one in England, is, that their work is put together more evenly and stronger, to carry their locomotive engines, which weigh two or more times as much as passes on our road. Our road is graded so as to have such a continued descent from the summit down, as for the wagons to descend on all parts of it by gravity. When they began to pursue this mode in England, I know not: ours was the first of the kind we had any knowledge of, and the English have not improved on it.

I am too good a republican to fear responsibility when I see my way clear. I should suppose the men of science in England would be governed in their knowledge of facts, the same as in other places. It is but a thing of yesterday, they had any knowledge of wagons going at the rate of twenty to thirty miles an hour; and they have no experience to test the consequences: to get these motions has caused them unusual efforts. The case was different with us: we had a difficulty to go slow; and we thought we had exploded the economy of a rapid motion before the English began theirs. I believe that if a railroad was made perfectly even, and could be kept so, that the wear and tear would be very different from what is the every day's experience. I am so unaccustomed to see perfect articles, that I sometimes doubt of their being such, and hardly to be expected on the track of long roads, exposed to all kinds of weather and casualties. I have never noticed a long bar of wrought or cast iron of an even degree of hardness, the whole length on all its sides.

I had an interest in a wire factory at the falls of Schuylkill, which made half a ton of wire per day—we cut the bars into five to eight pieces, (and our iron was the best we could select,) and it was a very rare thing to find the bars so evenly tempered as to bear reducing this small quantity without breaking, and generally in several places.

With the utmost skill and experience of our mechanics, we do not find them to bore a steam engine cylinder perfect; the pistons all require pack-

ing, to prevent the escape of steam. I never noticed a wheel cast perfectly true; we cast ours in, (turned) but they do not come out perfectly correct; and if they were cast or turned true, it is as difficult to wedge them on perfectly correct; so difficult is the attainment of perfection on this side the grave. With these difficulties before us, I will take it for granted, the wheel of the cars is 1-16th of an inch out of truth, and that they are three feet in diameter: to go thirty miles an hour, would require them to revolve 278 times per minute, and the wagon and load weighing four tons, is one ton to each wheel: each wheel of the car strikes the road with a weight of one ton 273 times a minute, faster, I presume, than any man can count: besides this evil, the materials which compose the heaviest item of expense are of a perishable nature, whether used or not, and wear and tear proportioned to use. These are some of the reasons why I believe a road will not be made perfect; and if so made, will not last interminably long, like the materials in a canal.

I am asked if I could, on my experience, check the spirit of investigation and enterprise that is abroad in the country? I answer certainly not the former, but as to the latter, I think it only valuable when governed by prudence, and then only it is invaluable. I recollect very well when the coal trade, and even the making inland navigation in our country was in disgrace in the eye of the public; but neither is so now. The public is now extra hot in the same degree as it was extra cold formerly. The coal trade is now large, as well as respectable, in the opinion of the public; but there are no doubt ten times as many in the trade, as many canals and railroads talked of to transport coal to market as there are markets for the article. Can this, then, be an enterprise wanting a spur? or what can the numerous canals and railroads contemplated be worth if made? A canal has two advantages over a railroad, besides the economy of using. Their number of sites are known, and they are limited by water; and if they are made faster than the wants of the country, occasioned by a feverish state of the public mind, or by an error of judgment, they do not decay whether used or not, except the lock gates and wood work, of which there is very little since hydraulic lime has been brought into use. I believe that a railroad can be made strong, solid, and true enough, to not only admit of a speed upon it of six miles an hour, but even sixty miles an hour, for a short time; but I do not believe there will be economy in going more than six miles an hour with heavy loads, unless it is with passengers, valuable goods, &c. which will bear heavy tolls. Our company have no reason to dislike railroads—ours has undoubtedly saved $50,000 already; but, by our canal, we now go an equal distance at one-fourth the cost of the railroad. But a canal cannot be made to the mines, so we resort to the next best thing.

J. L. Sullivan says, "The Stockton and Darlington road is certainly kept in the best repair, and is the best constructed railroad now in operation in England. Cast rails have been tried, but malleable rails are principally used, and decidedly preferred by the proprietors."

This road has been made about five years, and since that time they have condemned the old plan. But what say they of the best English road in October last? The London Mechanics' Magazine, of Oct. 1829, page 141, has the succeeding observations: "The speed of the engines has been increased on the Darlington road, by substituting wheels of four feet diameter instead of three feet; but these, working on the plane bars, cannot be case-

hardened, for fear they would turn round when they have a hard pull; consequently, they are made of soft iron, which, from the immense weight of the engine, wears them in grooves the width of the rail, and twists them sideways, which keeps men incessantly on the line setting them straight."

So we find thirty years' experience is condemned, and all that we now have worthy of our notice, are the experiments of a few days or hours, and these are leading brother Jonathan by the nose. Thus much for the best railroad in England. But still I *allow* they may make them stronger, although not so as to prevent those effects in a greater or less degree, if a speedy motion is resorted to, particularly with a locomotive engine, as the stress necessary to pull the load impinges through the wheels on the road, and thus the joints of the road are pulled together between the wheels of the engine and the cars, so as to keep up an incessant action in the rails. J. L. S. gives us credit for constructing our railroad at $1500 per mile; no one has the company's authority for this; our statement was $3050 a mile, and most of it was laid on an old turnpike and single track.

The Manchester and Liverpool railroad is not a fair comparison for other railroads; neither is the Novelty engine justly cited as a standard by which others are to be judged. The quantity of valuable merchandise passing between the two towns is said to be 1200 tons daily; and the passengers only, it is supposed, will produce $111,112 per year. The whole length of this road is but 32½ miles. They can, therefore, afford to construct it in a manner approaching as nearly to perfection as possible. The Novelty has had but a limited trial; our last accounts made it amount to a period of about six hours. It would hardly be prudent to invest millions on a thing that was not as durable as Jonah's gourd. It may do well: it is a neat affair enough; but it would be safer to wait a year or more before we pronounce it entitled to full faith, or consider it of such amazing utility, with no other data for our decision than the result of six hours' experimenting. Its boiler carries but 36 gallons of water, which is the main cause of its lightness. To produce the requisite steam, the evaporation must run rapidly from this 35 gallons of water; and if the supply pump does not correspond with the making of the steam for a few moments, a blow up is the inevitable consequence.

To compare railroads and canals by dollars and cents, as far as we have practice and experience for our guide, will, no doubt, be coming nearer the point the public desire to attain. And whether it is gratifying to some or not, we, I trust, will all find that economy in the use of the improvements resorted to is the one thing needful, in which the public at large is most interested in having accomplished.

The annexed calculation is estimated from the cost, &c. of the Mauch Chunk road. But that part of it only from the summit of Mauch Chunk, being eight miles, descending the entire distance, and the whole owned by a single company, (so that we are exempt from the interference of neighbors,) it is presumed that it can compare in its use with the minimum cost of a first rate railroad under the most favorable circumstances.

Estimate of the repairing, &c. of the perishable part of the railroad with double tracks.

For one mile, 20 tons plate iron, cost for iron and laying down, $2,000; last, say 20 years - - - - - - $100 00

20

Wood for rails and sills, 126,720 feet, at $15 -	$1,900 80	
Carpenters' work, say - - - -	1,900 80	
	$3,801 60	
	$3,801 60 last six years÷6=	633 66
One man repairing road to each mile 250, days - - -		250 00
Cost of repairing one mile per year - - - -		$983 66

If the transportation be 100,000 tons, it is, say one cent per mile; and the repairs increase with the increase of the use of the road.

Wear and tear, or renewing of the railroad wagons, they lasting 4 years.

42 wagons (load a boat) cost - - - - -	$4,200
7 mule wagons - - - - - - -	350
	4,550

Last four years is $1137 50 per year.

225 days in the season, and 32 cwt. each wagon going two trips a day, is 134 tons 8 cwt. a day, or 30,240 tons a year÷1137 50=3.76÷9=42.100

Making daily repairs to wagons, three hands, 225 days - -	$ 675
Materials for repairs - - - - - -	1,350
Annual cost of current repairs - - - - -	2,025

2,025÷0 miles=$225÷30,240 tons is per ton a mile, 74-100 of a cent.

Total repair of wagons 1 16-100 cent per ton a mile.

Cost of hands and animal power from the summit to the end of the road, descending all the way.

28 mules go two trips a day, and draw up 42 coal and 7 mule wagons (to carry down the mules) each trip, &c. going 32 miles a day, the 42 wagons each carry 32 cwt. coal each trip. Total 134 tons.

28 mules at 33 cents a day, - - -	$9 24
4 drivers, 90 do - - -	3 60
	12 84÷134=10 cts.

for 8 miles, or 1¼ cents a ton a mile.

This 1¼ cent a ton a mile is the *nett cost*, without any contingencies; the cost last year was 17½ cents for 8 miles, being say 2 cents. The difference between the two was made up of the superintendent of the railroad, hands assisting to provide for the animals, lost time through the season, keeping animals in the winter, &c making the *whole* cost, at a close estimate, 4 16-100 cents a ton a mile, exclusive of interest account and grease.

Canal estimates of transportation and repairs of canal.

The boat carrying 75 tons makes a trip loaded, down to Easton, 46 miles, and returns empty in 4½ days.

3 men at 90 cents.	=270×4½ days=	12 15
2 horses and rope, 85 cts.	=170×4½ days=	7 65
Boat, 70 cents a day,	4½ days=	3 15
(Boat cost $700, and last 1,000 days)		22 95

$22 95÷75 ton=30 60-100÷46 miles=a ton a mile 66⅔-100.

Wear and tear of the canal.

The lockage from Mauch Chunk to Bristol, in tide, is 524 feet, which, 8 feet lifts, is 66 locks, distance 106 miles; 66 locks will require their gates renewed every 10 years, and the cost of a set of gates, say $500 × 66 = $33,000 ÷ 10 for their duration, is per year,

$3,300 ÷ 106 miles, per mile, - - - -	$31 12
52 hands, 250 days, being 1 hand to 2 miles, repairing, (after 8 years duration) is, a mile, - - - - -	125 00
	156 13

100,000 tons ÷ $156 13-100 = 1½ miles, or 15-100 a mile, which, added to 62½ 100, makes the total cost of transportation by canal, including wear and tear of canal, 81½ 100 cents a ton per mile, exclusive of interest.

Our present cost of transportation on our canal, in *rough arks,* is, per ton per mile, - - - - - - - 1 cent

To which add the wear and tear of canal, as above, do do 15-100

Total cost, *at present,* per mile, per ton, - - 1 15-100

Hence, it appears that our canal, used in the ordinary way, will cost less than one-fourth of a first rate railroad.

It may be observed, that I have not noticed the cost of lock gate keepers; this was omitted, because the water power passing from one level to the other to keep them up, will produce a revenue greater than their pay.

There are two items, not heretofore taken in account, that will lessen the cost of transportation on the canal, where there is plenty of water as in the Lehigh and Delaware, viz: one is, that, as *the freight is mostly downwards, half the power may be saved by letting a current pass down the canal;* the other is, that, *by using propellers,* and having two locks at each lift. one for ascending and the other descending, *we can save all the animal power by substituting water power,* and one-third of the hands; thus reducing the cost of transportation about one half. Our railroad friends must allow us to avail ourselves of improvement in canals, if they take that course in railroads. But, in making my estimates, I have endeavored to consider what expenses *have occurred,* rather than what *may* occur; for many of our supposed improvements oft times prove injurious, rather than beneficial, to those who have been at the trouble and expense of making them.

JOSIAH WHITE.

5th mo. 20, 1830.

The following are extracts from letters of Mr. White, to a distant correspondent:

"MAUCH CHUNK, *3d mo. 5th,* 1830.

"Railroads are a great improvement on turnpikes; but, in my opinion, are vastly inferior (particularly as a public work, and in a republican country) to canals, both as to conveniences as well as economy. A canal is accessible everywhere, a railroad nowhere, (without interrupting the current of wagons,) except by an arrangement for turning out; and the more turn outs are made, the greater the casualties. By canal, every boatman may choose his own motion, within the maximum motion; by railroad, every traveller must have the same motion, or be subject to turn outs: which, as I have said, have their casualties. The motion of twenty and thirty miles

an hour on railroads will be fatal to wagons, road, and loading, as well as human life.

"We have a distance of eight miles from the mines, with a descent of seventy to one hundred and twelve feet in a mile. The velocity of the wagons would exceed thirty miles an hour, if not checked. Our first two months' use of the road was fifteen and twenty miles an hour; which would have soon ruined both road and wagons, and, I am persuaded, was then dearer than the turnpike we put our rails on.

"Our present motion, say of six miles an hour, is very satisfactory; and makes the railroad an immensely valuable appendage to our coal business. Wet or dry, we go on it; moist and wet weather, which ruins turnpikes, makes the wagons run freer on the railroad; snow, however, is an impediment. Our wagons will not run down from the mines, by gravity, in a snow storm; the snow packs on the road. In such weather, as well as in sleety weather, we cannot use the break, as it slips too freely to produce the necessary friction to check the wagons.

"I think it rather fortunate for society, that railroads are not of equal value to canals, for a railroad can be taken any where; and, consequently, no improvements would be safe on their line: for the moment the improvement succeeded, it would be rivaled, so as to destroy both, &c., whereas we know the line and limit of our canals, by the supply of water, and graduation of the ground; so that all improvements thereon are safe against the undermining of rivals. I should consider, that, if the railroads superseded canals, they would, for the above reasons, render the tenure or value of property as insecure as it would be if without the protection of law."

"Mauch Chunk, *3d mo. 25th*, 1830.

"Thee, no doubt, has observed the last accounts of the "Novelty" locomotive engine on the Manchester and Liverpool railway, stating that the fuel (at ten shillings sterling a ton for coke) cost but thirty-seven shillings sterling, to carry a ton of goods round the world; and that the owners offer to make engines to weigh five tons, and draw one hundred tons, that shall not consume more than about one-third of a mill, our money, a ton a mile. This, no doubt, will be received as a well settled experiment, in favor of railroads, and against canals.

"I suggest, if this engine is of the superior order represented, that it is *equally adapted to canals*, by having a less power, and proportioning it to the load it has to draw. Our canal can carry boats of one hundred and forty and one hundred and fifty tons. Our State canals generally carry boats of seventy five tons. This power can be applied as advantageously on the canals as on the railroads, by having light rails on one or both sides of the canal for the wheels, which drive or draw the boat to run on, and keeping the engine on the boat: by which means, the engine will, no doubt, be made to last three times as long as if on a railroad, from the incessant jarring of the latter. Thee will perceive, by the tables in the books on the subject of railroads, that, at two and a half miles an hour, the effect from the same weight is 55,500 pounds by canal, and 14,400 pounds by a level railway; so that the same engine would propel three and a half times as much on a canal as on a railroad, and, of course, save two-thirds the fuel, and the same proportion nearly of the power of the engine, in addition to its increased durability.

"With regard to engines on railroads, moving with equal weight with indefinite velocity, it is proved by us, and on the Liverpool railway, to be a false theory; the motion invariably was reduced by adding to the weight to be pulled; and the wear and tear, no doubt, is as the velocity, the weights being equal."

It is not deemed improper here to insert the opinion of the oldest and most eminent civil engineer in the United States of America, who has served more than fifteen years in the best school for all practical service, that of experience.

Extract from a letter of Benjamin Wright, of New York, dated October 31, 1831, in reply to a letter addressed to him by the President of the Chesapeake and Ohio Canal Company:

"The Delaware and Hudson Canal Company own 108 miles of canal, on which there is 110 locks; and also 16 miles of railroad, on which there is 5 steam power stationary engines to draw up coal 800 feet, and 3 self-acting planes, to let down coal about 700 feet.

"The board of directors were not satisfied that all these works, in mining coal, in transporting over the railroad, and along their canal, were managed with that rigid and strict economy which the competition in the article made useful and necessary for the interest of the company, and they appointed myself and one other gentleman to go through all their work, and examine into every expenditure, of what had been, as well as what, in our opinion, ought to be done, to economise in mining the coal, in transporting over the railroad and along the canal, to tide water. We had full powers to call on every man in their employ, and examine into every expenditure, in all its details, so as to report what would, in the present state of things, when the railroad and canal were both in good order, be a fair and proper charge on the coal.

"We spent 20 days in this duty, and made our report to the board of directors. We found that the expense on the railroad, not including any toll, would be about 3¾ to 3½ cents per ton per mile; and on the canal, without toll, one cent to one cent and two mills per ton per mile. We took great pains to get every information on all points having the least possible bearing, and I have no doubt the comparison is a fair one for *this canal* and *this railroad.* Perhaps railroad advocates may say that this is not a fair sample of railroad to compare with. In so far as it is loaded with 5 steam engines, as stationary power, to draw up coal, and 3 self-acting planes, to let down, it has an extra charge upon it; but then the great number of locks on the canal causes detention and increases expenses. As the result came out so nearly like Josiah White's statement on the Mauch Chunk canal and railroad, as published in the Intelligencer some two years ago, and proved the correctness of that statement, and as their railroad was not subject to stationary power, I consider the comparison a fair one on the whole."

Letter from the same to the same, of subsequent date.

NEW YORK, *Dec.* 17, 1831.

DEAR SIR: You ask me my opinion of the comparative advantages of canals and railroads, as applied to the Potomac valley, and the great plan of a connection between the eastern and western waters?

This question presents a great field for argument, and no doubt much may be said on both sides. I will, however, give you my own views as applied to the locality in question.

I am decidedly in favor of a canal in preference to a railroad, and more particularly for that part between tide water and Cumberland, and between Pittsburg and the mouth of Casselman's river. As to the intermediate space, a question might arise whether the great amount of lockage and the long tunnel would, *at present*, justify the expense of a canal in preference to a railroad. Time, and the probable prosperity of the country, when a dense population should cover it, along the line and beyond it, would probably justify a continuous water communication over and through the mountains, in half a century or less.

These are the outlines of the results of my own mind as applied to this case.

I am probably, at this time, in a minority in the United States as to my opinions of the comparative advantages between canals and railroads. I have very little doubt I shall be in the majority before two years more are expired.

The public mind does not, in my opinion, take all circumstances and bearings into consideration, when they undertake to give opinions. They hear of the Manchester and Liverpool railroad, and of the great effects and results produced on it, but they do not know the whole of the expenditure as well as the whole receipts. In this case, as well as in the Baltimore railroad, we are kept in the dark about wear and tear, and shall be for some time to come.

I admit that, for passengers, a railroad is a useful and rapid conveyance, but, in our country, and particularly on the Potomac valley, the passengers are a small matter compared with the products of the soil and the forests and mines. We know that the Erie canal has more tonnage, in lumber, than all other tonnage on it, and, for the article of square timber alone, this year, the rafts of it, which have passed, (being rafted only 14 feet wide, so as to pass locks) would, if put together, stretch 50 miles. This is an article of first necessity, and could not come as cheap, if at all, on a railroad as on a canal. I may add boards also, which are brought in boats much better than on railroad wagons.

But the great advantage a canal will always have over a railroad consists in the little mind, or thought, that is required to use it. Any man or boy can navigate a canal, but it requires much more mechanical skill to manage on a railroad even by horse power, and many times as much more, to manage a locomotive. I consider a long line of railraid, when the power is often changed, as it must necessarily be, in passing from Baltimore over the mountains, as a very complicated machine; as liable to have its parts get out of order, at a distance from any work shop, where repairs can be made; and as being odious in this country, as a monopoly of the carrying, which it necessarily must be. A canal, on the contrary, is open to any man who builds a boat, and he may travel or stop, when and how he pleases, if he does not interrupt the passing of others.

In short, I place a railroad between a good turnpike and a canal. I consider the expense of transportation, from the little experience I have had, to be about in the proportion of three to one, between a canal and railroad, in favor of the former, without tolls on either. All these opinions are the conclusions of my own mind, from critical examinations of works of both kinds,

and all the light I have been able to obtain on the question. I could say much more, but I presume what is said above is sufficient answer to your question.

With much esteem, I am, dear sir, your obd't serv't.

BENJ. WRIGHT.

Gen. MERCER.

Letter from John Bolton, late President of the Delaware and Hudson Canal Company, to the Editor of the Savannah Georgian.

NEW YORK, *July* 21, 1831.

DEAR SIR: I perceive that some of the papers are endeavoring to arouse the people of Georgia to a sense of the importance of artificial means of transportation between the interior of the State and the coast. Both interest and good will induce me to wish them success, and, were I a young man, I should like much to take a part in executing any work that should have a favorable bearing on Savannah. A six years' experience in the construction and operations of the works of the Delaware and Hudson Company would give me some advantages; but, as it is, I can only offer my good wishes and any useful information that may be in my power. From the articles I have seen, I perceive with some regret that they entirely overlook the great natural advantages that Georgia has over most of the States in the construction of canals, and recommend railroads; which are the only resource of those who do not possess facilities for canals, and who, consequently, endeavor to make the public believe that they are superior to canals. In this they have succeeded to some extent for the present; but, having some experience of both, I am not among the converts to this new system. I give it a place between turnpike roads and canals, and feel a confidence that time will confirm this order; and this only in cases where the amount of transportation will justify the expense of a railroad.

In a late report to the proprietors of the Liverpool and Manchester railroad, it is stated that they had reduced the expense of transportation from £15 per ton by canal, to £10 by railroad, for 32 miles. This reduced rate at 7 per cent. exchange, is $2 37½ per ton. On the Erie canal and Delaware and Hudson canal, the highest rate on merchandise, including toll, freight, and receiving and forwarding, is 5 cents per ton per mile, or $1 60 for 32 miles; on flour and other articles of small value it is still less. Flour does not exceed, for long distances 3 cents per ton per mile, making only 96 cents for 32 miles. On the Delaware and Hudson canal, a boat carrying 30 tons costs $400; 5 per cent. per annum will keep her in repairs. It requires 12 wagons to carry the same weight on the railroad, cost $1,400, and the repairs will probably be from 15 to 20 per cent. The annual repairs of the canal is about $400 per mile; the railroad about $1,500 per mile. The canal is getting better every year, the railroad worse. The railroad of the Delaware and Hudson Canal Company passes over a rough, uneven country, and has eight inclined planes. The wear of machinery and ropes on these planes is very expensive, and bear a greater proportion to the length of line that would be found in Georgia below the mountains. I have, however, no doubt that the annual expense of railroads will be found to be greater than is generally estimated.

The greatest advantage claimed by the advocates of railroads over canals, is in the rapidity of travel; and the Liverpool and Manchester railroad furnishes the grounds for this claim, as the results of the Erie canal have furnished data on which to found similar projects, and both are equally exposed to disappointment. The Liverpool and Manchester road has cost $118,000 per mile, whilst, in this country, we estimate our railroads to cost from 5 to 12,000, and nothing is now better ascertained than that strength and firmness must be in proportion to velocity of movement; and that, to avoid the expense and delay of inclined planes, hills must be cut down and valleys filled up. These requisites cannot be attained without great expense, except in locations peculiarly favorable, but strength and firmness are indispensable in any location. Besides, there is one advantage claimed in favor of railroads, in this quarter, which is not applicable to the South. The waters diminish here at the period of greatest business: the reverse is the case at the South. Here also canals are shut by ice in winter, and then it is believed railroads will continue to be used, but, from my experience, the expense and difficulties will be found to be much enhanced; and where inclined planes are used, so much so as to forbid their use upon a calculation of profit. I write from no other motive than good will towards my fellow-citizens of Georgia. I wish them prosperity, and should therefore regret to see them carried away by the fashion or mania of the day.

The above letter appeared in the Savannah Georgian of the 25th of August last. Its author is John Bolton, Esq. of New York, late President of the Hudson and Delaware Canal Company. The letter, as the paper observes from which it is copied, contains lessons of practical knowledge, worth a thousand of the wild theories of untried experiment.

Extract of a letter from John Bolton, Esq. of New York, late President of the Hudson and Delaware Canal Company, to the President of the Chesapeake and Ohio Canal Company, dated New York, Dec. 17, 1831.

"Having resigned my station in the Delaware and Hudson Canal Company early in April last, the document to which you refer is not accessible to me. I can, however, repeat on the subject what I stated to Mr. Habersham, that the Delaware and Hudson canal is 108 miles, the railroad 16 miles; that the toll on coal on the canal was revised, I think, in January last, and fixed at $1 50 per ton for the whole distance, and on the railroad at 50 cents per ton; that the expense of repairs and superintendence on the canal was estimated, for 1831, at about $400 per mile; and on the railroad at rather more than $1,500 per mile; that the railroad has 8 inclined planes, 5 worked by steam engines and 3 by gravity; and the canal has 110 lift locks, and 3 guard locks, used also as lift locks in high water; and that the form of country and obstacles to be overcome on the line of railroad are not more unfavorable for a railroad than the canal line was for a canal; that a section of canal on the Delaware river, of 1 mile and 8 chains, cost full $40,000, and there are several shorter sections proportionably expensive. For the rest, I must beg to refer you to my second letter to Mr. Habersham. I may, however, add, that I corrected, on more recent information, the error in my first letter, as to the cost of the Liverpool and Manchester railroad:

I think I made it out to be $149,000 per mile. I have no specific information of late date in relation to railroads in England, nor have I seen lately any quotations of the value of canal and railroad stocks in England. There is, however, no doubt on my mind that railroads in England are getting the station which I long since assigned them, that is, between turnpike roads and canals. Gentlemen from that country say they are less popular than they have been; that, in fact, the mania is wearing off by reason of the great expense of maintaining them and the machinery used on them; and it was recently stated that a project, got up in Birmingham, had, by a resolution of the contributors, been suspended for six months, for the purpose of seeing the results of those then in operation."

Extract from the last annual report of the Pennsylvania Canal Commissioners, to the Legislature of that State, dated December, 1831.

"The board have, in like manner, been frustrated in their calculations by some of the contractors for laying rails, abandoning their contracts. The difficulty of procuring stone blocks of a suitable quality has proved to be much more serious than was at first anticipated, and the consequence has been a retarding of the work, and an increase of its cost over former estimates. The present estimate of the cost of the whole work, when completed, is $2,297,120 21, being equal to $28,173 63 per mile.

"The work is constructing upon the principles of the latest improvements in railroads, and in the most substantial manner; and, although the cost of it may appear to be large, yet, when the quality of the work, and the sum required to construct similar works elsewhere, are duly considered, it is perhaps as reasonable as ought to be expected.

"The graduation and masonry alone of the first twelve miles of the Baltimore and Ohio railroad cost $46,354 56 per mile; and that whole road, now under contract, (being 71 miles upon the main stem of the road with *double tracks*, and a branch of 3½ miles to Frederick with a *single track*, one third of the whole road to be laid with stone rails, and the remaining two-thirds with wood) is estimated to cost $1,906,853, or $27,228 per mile. The company, in their late report, state "that it required 6½ months to lay down 6 miles of stone track," and "that the cost of laying with stone has been underrated in every instance." The celebrated Liverpool and Manchester railroad, in England, which has been the principal cause of creating an excitement in public opinion favorable to that species of improvement, cost the enormous sum of 117,000 dollars per mile.

"While the board avow themselves favorable to railroads where it is impracticable to construct canals, or under some peculiar circumstances, yet they cannot forbear expressing their opinion, that the advocates of railroads generally, have greatly overrated their comparative value. To counteract the wild speculations of visionary men, and to allay the honest fears and prejudices of many of our citizens, who have been induced to believe that railroads are better than canals, and consequently that, for the last six years, the efforts of our state to achieve a mighty improvement have been misdirected, the canal commissioners deem it to be their duty to advert to a few facts which will exhibit the comparative value of the two modes of improve-

ment for the purpose of carrying heavy articles cheaply to market, in a distinct point of view.

"Flour is now carried by the canal to Philadelphia from Lewistown, 211 miles, for 62½ cents, and from Harrisburg, 150 miles, for 40 cents a barrel; and gypsum is taken back for three dollars a ton to Harrisburg and five dollars a ton to Lewistown, therefore the freight (exclusive of tolls) is, downwards, 14½ mills per ton per mile, and returning, 7 mills per ton per mile; or on an average both ways, one cent and three-fourths of a mill per ton per mile for carriage.

"On nine miles of railroad at Mauch Chunk, and on ten miles of railroad between Tuscarora and Port Carbon, the carriage of coal costs 4 cents, and the toll on the latter road is a cent and a half per ton per mile.

"The comparison will then stand thus:

On ten miles of railroad between Tuscarora and Port Carbon:

Freight per ton,	40 cents.	
Toll on coal per ton,	15	
	—	55 cents.

On ten miles of the Pennsylvania canal:

Freight per ton,	10¾	
Toll on coal at half a cent per ton per mile,	5	
	——	15¾
		39¼

"Being 39¼ cents difference in favor of the state canal on each ton for every ten miles of transportation.

"The following table will exhibit the relative useful effects of horse power when employed on common roads, on turnpike roads, on railroads, and on canals.

Four horses will draw, in addition to the weight of the carriage or boats containing the load,	Weight of Freight transp'rt'd	Number of miles per day.
On a common road, in a wagon,	1 Ton.	12 Miles.
On a turnpike road not exceeding five degrees of inclination, in a wagon,	1½ "	18 "
On a railroad having a rise and fall of 30 feet, (or one third of a degree) to the mile, in 8 cars,	16 "	27 "
On the Pennsylvania canal, in two boats,	100 "	24 "

"The introduction of locomotive engines and Winan's cars upon railroads, where they can be used to advantage, will diminish the difference between canals and railroads in the expense of transportation. But the board believe that, notwithstanding all the improvements which have been made in railroads and locomotives, it will be found that canals are from two to two and a half times better than railroads, for the purposes required of them by Pennsylvania.

"The board have been thus explicit, with a view to vindicate the sound policy of the commonwealth in the construction of her canals; yet they again repeat that their remarks flow from no hostility to railroads, for next to canals, they are the best means that have been devised to cheapen transportation. They are valuable in many situations, and particularly along courses of great thoroughfare, which will bear the expenses of their construction. They can be made to carry the United States' mails and passen-

gers, and also light valuable goods, where *time* is of more importance than cost of transportation."

"*Alleghany Portage Railroad.*—The length of railroad, from the east end of the lower basin at Hollidaysburg, to the west end of the basin at Johnstown, is 36 miles and 221 perches; but between the head of the basin at Johnstown, and the upper basin at Hollidaysburg, the distance is only 35 miles and 310 perches."

"A space one hundred and twenty feet wide, has been staked out and appropriated to the use of the commonwealth, the entire length of the railroad. The reasons which governed the board in occupying so much ground, are these: It was necessary to clear off the tall heavy timber of the mountain, for at least 60 feet on each side of the centre of the road, and hereafter the incalculable trade of the Mississippi basin and the lakes, will require an additional number of tracks over the mountain; hence, prudence seemed to dictate the propriety of appropriating to the use of the state, as much ground as may hereafter be required, while it is at present, of very little value."

"The bed of the road is graded 25 feet wide, for a double set of tracks."

"The railroad when completed with a double set of tracks of stone and iron with the necessary machinery, the whole executed in the best manner, is at present estimated to cost $1,271,718 18. The amount of work done on the 1st day of November was $75,195 96, of which $63,984 84 has been paid, and $11,211 12 is retained."

"It may be proper here to remark, that the cost of the work yet to be done has been estimated at the contract prices, with a liberal per centage added to cover contingencies; and, although estimates have hitherto proved little else than their own fallacy, yet the board believe the above is ample, and may be relied upon."

The Pennsylvania Canal Commissioners after saying, in their report of the *estimates* with which they had hitherto been furnished, that "*they have proved little else than their own fallacy,*" speak of the Columbia and Philadelphia railroad, as having had work done on it of the value of 231,000 dollars; and acknowleged that, so far as the work has gone, it has cost more than the estimates. The present estimate of the whole work, they state "to be $2,297,120 21, being equal to $28,173 63 per mile."

Of the Alleghany Portage railroad, between the Juniatta and Conemaugh rivers, in length about 36 miles, upon which but $75,000, has been as yet laid out, they say, "that the bed of the road is graded 25 feet wide for a double set of tracks;" and that "when completed, with the necessary machinery, it is at present estimated to cost $1,271,718 18," being about $35,325 per mile.

In the sixteenth report of the Board of Public Works, to the General Assembly of Virginia, Mr. Crozet, the principal engineer of that commonwealth, in his report to the board, expresses himself as follows:

"From their acknowledged superiority in a great many instances in England, railways have obtained warm advocates in this country, though the opinion seems most generally to prevail that they are not applicable here. Without attempting to judge of what is expedient in other states, I am of opinion that, at least in Virginia, railways could not be extensively introduced."

The engineer then proceeds to consider the expediency of a railroad, as a substitute for the navigation of James river; and concludes (p. 491) with the following remarks in relation to a railroad across the mountains:

"The making of a railway across the mountains has been also mentioned; but it would be attended with still greater practical difficulties.

"In the first place, the mountains are so rugged and broken, that the only practicable way to carry this plan into execution would be to follow the valley of some creek, which leads up to the top of the dividing ridge. But here all the difficulties presented in the valley of James river would be greatly multiplied. The graduation of the road must be almost every where among cliffs; its windings would be more numerous and considerable; the deep cut would be enormously expensive, and the stationary engines and inclined planes very frequent, &c. After having, at an immense expense, established the foundation of the railway, blocks of stone must be obtained, shaped, and transported into a complete wilderness, and put into their place. Then castings must be obtained from a foundry at the rate of at least one hundred and twelve dollars per ton, and transported an immense distance to this same wilderness, to form a railway perhaps one hundred miles in length, at the rate of nearly one hundred tons of iron per mile, exclusive of fixed steam engines and machinery.

"In England, where facilities of all sorts are concentrated, where there exists an extensive practical knowledge of these things, the nice adjustment of railways may not be thought an object capable of having a material influence on the expense; but, among the mountains of Virginia, far from foundries, rails would have to be procured of particular shapes to suit each of the numerous curves of the road, and counteract the centrifugal force of the wagons in the turns.

"What the expense of railways, made under circumstances so unfavorable, would be, I am not prepared to say; but certain it is, that it would be immense, and that the present state of things would not justify it."

In a letter of this engineer, dated the 6th of August, 1831, to Benjamin Wright, who was associated with him in an examination and report on the best mode of improving the channel of intercourse along the valley of James river, he says, "As regards the railroad plan, I have estimated it as about equal to the cost of (meaning, evidently, *in cost* to) a canal."

The associate engineer, with more precision, says, in his letter to the Governor of Virginia, of the 7th of April, 1831—

"I arrived in Richmond on the evening of the 23d July, in order to commence upon the execution of the duties as associate engineer.

"I was a little disappointed in not finding the chief engineer at the seat of government; the fault is, perhaps, partly chargeable to myself, in not adverting to the fact of the great extent of territory of the State; and that the duties of the chief engineer might call him to the extreme parts of it, and therefore, a longer notice of my intention to visit here ought to have been given.

"In waiting the return of the chief engineer, I have (through the kindness of the Second Auditor,) employed my time usefully and beneficially, in the examination of all the reports, plans, profiles, and estimates, &c., which have been made, from time to time, of the valley of James river, and New river, and the intermediate country, where a probable connection, as contemplated by the act of April 7, 1831, might be made.

"On the 3d of August, the chief engineer arrived in Richmond, and the next day we had a conference upon the proper course of duties to be pursued, under the act of the State, and the appointment which brought me here.

"I took the liberty to address a note to him, a copy of which I enclose, as also his reply thereto.

"Your excellency will perceive, that the chief engineer has, by his former official reports, at various times, expressed opinions upon the kind of improvement adapted to James river valley, which opinion, I could not expect he would controvert. Situated as I now am, I have only to make up an opinion of my own, which I have done from the reports, estimates, plans, and profiles, before referred to, and from a personal examination of the valley of James river, from a point above Blue Ridge to Richmond, for an improvement of this kind, in 1824.

"By the act of the Legislature above named, it appears there are three plans or kinds of improvement, to be *examined* and *estimated.*

"1st. Dams and locks—Moving power, supposed steam.

"2d. Canal—Continuous.

"3d. Rail-road from Richmond to Lynchburg, and supposed to be continued westward to the proper point at the western waters.

"If the act comtemplated an estimate of the whole of these several routes mentioned in it, from a personal survey made by us, all these duties could not be performed in less than two or three years, in such manner as an engineer would like to be responsible for their great accuracy. Believing as I do, that any further survey to enable me to make up an opinion of the kind of improvement which I think the State ought to adopt, are unnecessary, and that an approximation of the cost of executing such improvement can be so nearly determined at this time, as is useful or important to permit a legislative body to act beneficially for the State, I take the liberty to give that opinion, which you can use as you think proper.

"1st. Lock and dam navigation, with a moving power by steam tow-boats.

"I have carefully examined the report and estimate of the chief engineer, for locks and dams in James river, from Maiden's Adventure to Covington.

"I am very sorry I cannot agree with him as to the cost of such a work. My own experience, and what I have seen of such works executed by others, applying the principles as far as they are applicable to James river valley to Lynchburg, and I cannot make such an improvement for double the money estimated.

"If such an improvement was made, there are strong objections to the moving power. It requires too much mechanical skill, and either the State or some wealthy individuals, must become the carriers.

RAIL-ROAD.

"If a rail-road should be adopted, it ought to start from Richmond instead of Maiden's Adventure: this would destroy all the use of the present canal.

"I do not believe a railroad, with two tracks, permanently constructed, and proper turn-outs and fixtures, can be constructed for so small a sum per mile as a good canal.

"It requires great mechanical skill, if the moving power is locomotive engines, and without these, applying only horse power, it will be found that no great speed is gained, and it is certain, that the expenses of transportation per mile will be much greater than on a canal. Property cannot be as safe from storms and depredations, as in a good canal boat under lock and key.

CONTINUOUS CANAL.

"Of all the three plans which have been directed by the act, so far as the valley of James river from Maiden's Adventure to Lynchburg, the best, in

my opinion, is an independent canal, with such connections with the river, as can make it accommodate the south side.

"The simplicity of a canal, and its adaptation to the capacity of every man in the community, will certainly make transportation on it cheaper than any other mode.

"It is, without doubt, better suited to James river as far as Lynchburg, and probably taking into consideration what has been done at the Blue Ridge, it ought to be extended beyond that point. Every man is his own carrier, if he chooses to be so: he moves as he pleases, and stops when he pleases, if he does not interrupt others in a canal.

"The question arises then, if a canal is to be made, what shall be the size of it?

"If the canal between Maiden's Adventure and Richmond, can be so altered as to bring it to the size I would wish, (and I am inclined to the opinion that it can be so done, without very great expense,) I would then recommend, that the canal from Maiden's Adventure to Lynchburg, should be fifty feet surface, thirty feet bottom, and five feet depth of water in all its parts, where the excavation and embankments were good. At the heavy bluff points of rocks, where it is expensive, I would reduce the width so as barely to permit two boats to pass each other. Where I had culverts of any considerable size, I would reduce the width to forty feet, so as to save ten feet of masonry. The aqueducts I would build of stone, if good stone could be found, and cement is not too expensive. These I would have 19 or 20 feet water way.

"The present locks are built 85 feet between the gates, and 16 feet wide. These are entirely too wide for the canal. I should prefer locks of the length of the present ones, but not more than 14½ feet wide, or 15 feet at the extreme.

"Such a canal can be built along the valley of James river, from Venture falls to Lynchburg, *under good management*, for 18 to 20,000 dollars per mile, provided water cement can be procured at or near the Blue Ridge.

"It is proper that I should give a reason why I would enlarge the canal to the size I have mentioned, and give the banks a slope of 2 to 1. It is well known, by experience, that common earth is inclined to assume this shape when washed by water, and my experience leads me to believe, it is better to form the banks with this slope at first, than to supply the abrasion of the banks with new earth, after they have washed down and assumed this shape.

"Such banks, when raised above the natural earth are stronger, they will sooner take vegetation and be protected from wash, or if abraded, they are easier protected by a few small stones thrown along next the water surface.

"Many persons who have not examined the question, suppose that a canal increases in cost according to size: this is not the fact. It will be found, that for a canal of the size I have mentioned, the additional expense of excavation and embankment, over a canal of the size of the New York canal, will not exceed from 6 to 8 per cent., and this item forms the whole additional expense: the locks, aqueducts, and culverts, being the same upon the plan I propose.

"On comparing a cross section, it will be found that the one is 200 feet, the other is only 136 feet; and a boat loaded and moving at the rate of 3 miles per hour, the power to move her will be nearly 20 per cent. less in the large than the smaller canal.

"Such a canal will permit boats 75 feet long, 14 feet wide, and drawing 4 feet water, to carry 70 to 75 tons, if desired. My own opinion is, that the most profitable kind of boat will be found to carry about 50 tons.

"I have been thus particular in my views of a great plan of improvement from Maiden's Adventure to Lynchburg, and probably the same ought to be continued above the Blue Ridge.

"From the point where a canal ought to stop, and a rail-road commence, all the examinations are not quite complete: enough is known to show, that there is a favorable place to pass the Alleghany, either with a rail-road or canal. So far as I have examined the surveys made, the formidable difficulties appear to be on the New river: these may require examinations to determine what kind of improvement ought to be adopted.

"The law of April 7, 1831, appears to require of the engineer to state the advantages and disadvantages, the commercial benefits, the probable revenue, &c.

"Any statement of this kind from me, would not be entitled to a moment's consideration. It is well known to all persons who have been conversant with the opening of canals in this country, that a new kind of trade is opened: articles which could never reach a market by reason of the great expense of transportation, before the canal was opened, are brought in great abundance afterwards. It is well known, that more than half the tonnage now passing in the Erie canal, consists of property which would never have been moved at all, but for this easy and cheap conveyance.

"This view of the question, makes it impossible for any one to do more than conjecture the result of a great work of this kind.

"If it was thought proper in constructing a canal to make locks, aqueducts, &c., of more temporary materials, the costs per mile would be reduced, probably 20 to 30 per cent., but I cannot recommend this plan for such a work, in such a place as the valley of James river, and for the State of Virginia."

In a subsequent letter from the same to the same, dated August 9, 1831, he says:

"I have drawn up a short report, in which I have given opinions as to the various plans of improvement adapted to the valley of James river, and decided upon what I think best.

"I have not gone into long arguments to show why a canal is better adapted to the peculiar location of this valley. The simple fact that it is that kind of machine, which in its use, is brought to the capacity and understanding of every man in the community, is, in my mind, enough to decide the question.

"As to the cost, I have fixed the maximum, *under good management*, and this will make a permanent, excellent work. If the Legislature choose to make a less permanent work, of course the cost of it will be considerably less.

"I have not touched upon, or made any remarks to the improvement from a point on James river to New river. A railroad will, no doubt, be the improvement which ought to be adopted, and the surveys now going on will determine the best route probably.

"The public mind is now so unsettled in their opinions, on the comparative advantages and disadvantages between railroads and canals, and considering that it will take some little time to have the good people of Virginia satisfied, I have had doubts in my mind, whether it would be useful for me

to return here again. I fear I can do but little, if any good, under the impressions I now view the matter, and I presume you will see it in the same light. I have explained myself fully to Captain Crozet, and to the Second Auditor.

"I can only say, that if I can render good service to Virginia, I would return in October, but my view of the whole ground is against it, under a full belief that it would be useless. I regret that I could not have the pleasure to see you. The situation of my private affairs, which I adverted to in my former letter, make it very important for me to return to the north at this time."

In two reports made to the Liverpool and Manchester Railroad Company, by two eminent civil engineers, who were empowered, prior to making their reports, to visit all the railroads in use in England, for the collection of suitable materials to solve the inquiry propounded to them by the officers of that company, which was, by what means of transportation their railroad could be most effectually made to subserve its ends, the public convenience, and the profit of the stockholders? it is distinctly stated to be their opinion, that the commerce and intercourse between Liverpool and Manchester are not competent to maintain the cost of the application of *stationary* steam engines to that great thoroughfare, and that a greater velocity, than of ten miles per hour, ought not to be attempted by the locomotive engines, which they recommend as a less expensive propelling power, than the stationary. It was designed to incorporate, in this note, copious extracts from the reports of those engineers, which have, however, been somehow mislaid.

From an English work on railroads, of prior date, and by far the most valuable now extant, that of Wood, the following extracts will show, that, in 1825, the date of the publication of his treatise, the question was not regarded to be settled as to the relative value of railroads and canals. "Canals," says this writer, "ever since their adoption, have undergone little or no change; some trivial improvements may have been effected in the manner of passing boats from one level to another, but, in their general economy, they may have been said to remain stationary. Their nature almost prohibits the application of mechanical power to advantage, in the conveyance of goods upon them; and they have not, therefore, partaken of the benefits which other arts have derived from mechanical science.

"The reverse of this is the case with railroads; their nature admits of the almost unrestricted application of mechanical power upon them, and their utility has been correspondingly increased. No wonder, then, that canals, which at one time were unquestionably superior to railroads in general economy, by remaining in a state of quiescence, should, at some period or other, be surpassed by the latter, which has been daily and progressively improving; and perhaps that time is arrived. The human mind is generally averse and slow in adapting itself to the changes of circumstances; and though from this cause the competition in consequence might not have been so speedily brought into action, had not the present prosperity of the country induced capitalists to seek out every source of speculation, affording the least prospect of success. The natural course of events would, however, soon have developed the real situation of the two modes, in their respective relations to each other; and though the time might have been prolonged when railways were brought into active competition with canals, yet its arrival would not be the less certain.

"One might be led to suppose, that the question could readily be solved by an appeal to facts, or by the comparison of particular canals with similar railways; but it is here, I presume, where the difficulty lies; we cannot perhaps find canals and railways whose external features are precisely the same; we are obliged, therefore, to have recourse to a comparison of general facts or principles peculiar to each mode, which again cannot be accomplished, unless we are fully and intimately acquainted with all the various properties and characteristics of each mode. The want of proper data was felt, and it is with a view of furnishing these, that the present work was undertaken; which, by a concise, and at the same time comprehensive, description of the construction, uses and advantages of railroads, together with an elucidation of the various principles of their action, the reader might be enabled to make a comparison with other modes of internal communication, and thus form a judgment of their relative value.

"It is much to be regretted that a similar inquiry has not been made with respect to canals; the present state of commerce requires that goods should be conveyed from place to place with the utmost rapidity, and perhaps we owe no small portion of mercantile prosperity to our facility of despatch. The slow, tardy, and uninterrupted transit by canal navigation must, therefore, of necessity yield to other modes affording a more rapid means of conveyance, (especially when their relative economy is the same,) unless they can be made to partake of the general activity, and additional celerity given to the boats conveyed upon them. Experiments, to ascertain the amount of resistance at different rates of speed, would be therefore highly valuable; and it is to be hoped that such will be made on a practical scale upon some of the canals, to show how far they are capable of affording a more speedy transit."

"The existing agitation of the public mind, respecting the relative utility of railroads and canals, in the transit of goods from one place to another, renders it a subject of proper inquiry to ascertain the relative performances of the different kinds of motive power upon those two species of internal communication.

"I shall, therefore, give a brief comparison, founded on the foregoing deductions of the different kinds of motive power upon railroads, with the performance of horses by the present mode of canal navigation.

"Not having had an opportunity, from my own personal observations, of ascertaining, with sufficient accuracy, the weights which a horse will drag in a boat upon a canal, I shall be obliged to have recourse to the reports of those engineers whose practice in that line has enabled them to obtain the necessary data.

"Mr. R. Stevenson of Edinburgh, in his report in the Edinburgh railway, in 1813, states, 'Upon the canals of England, a boat of thirty tons' burden is generally tracked by one horse, and navigated by two men and a boy; on a level railway it may be concluded that a good horse, managed by a man or lad, will work with eight tons; at this rate, the work performed on a railway by one man and a horse is more than in proportion of one-third of the work done upon the canal by three persons and a horse;' and Mr. Stevenson, in his calculations afterwards, assumes the power of a horse, upon a good railway, equal to ten tons.

"Mr. Sylvester, in his report on the Liverpool and Manchester railway, gives twenty tons as the performance of a horse upon a canal, travelling at the rate of two miles an hour.

"The variation between the two statements may have arisen from the observations being made on canals of different widths. Mr. Stevenson, in another report, states, that the striking difference between the draught of horses, on coming out of a narrow canal into a more capacious one, induced the reporter to give the subject particular attention; and, by means of experiments made with the dynamometer, so far as he had an opportunity of carrying the experiments into effect, the difference appeared to be at least one fifth in favor of the great canal.

"Under these circumstances, I shall take the performance of a horse equal to that of thirty tons upon a canal, which is the greatest I have seen assigned by any one, and we have previously found the energy of his power equal to ten tons upon a railway: which will make the relative performances as 3 : 1.

"I am not acquainted with any experiments, made on a practical scale, to ascertain the ratio of the increase of resistance, either with different weights, or with the same load moved at different velocities, upon a canal; but it is assumed by all writers on the subject, as a law of hydrodynamics, which appears unquestionable, that the resistance at least is proportionate to the square of the velocity.

"Taking these premises as sufficiently established, the diagram III* will represent the resistances at different velocities; and the following table will show the relative quantity of work performed by horses dragging boats on canals, and carriages upon railroads.

Velocity in miles per hour.	Weight conveyed in cwts.	Distance in miles, being that which a horse travels in a day.	Resistance upon a canal in lbs., taking a horse's power at 112 lbs., and supposing this force will drag a boat of 30 tons at two miles an hour.	Resistance upon a railroad in lbs., as per Table VIII.	Power which a horse can exert upon the load, at the respective velocities, from formula $\frac{224}{v}$.	Number of horses required to perform the work upon a canal.	Number of horses required to perform the work upon a railway.	Ratio of the performance of horses, with respect to work on canals and railroads.
2	800	20	150	448	112	1.3	4	4: 1.3
3	800	20	337	448	$74\frac{2}{3}$	4.5	6	6: 4.5
4	800	20	600	448	56	10.7	8	18: 10.7
5	800	20	937	448	$44\frac{2}{5}$	21.2	10	10: 21.2
6	800	20	1350	448	$37\frac{1}{3}$	36.	12	12: 36.

* III.

Velocities - - - -	1	2	3	4
Spaces - - - -	1	1	1	1
Times - - -	1	1	1	1
Resistance - - -	1	4	9	16
Mechanical force required, acting for the above time - -	1	8	27	64
Mechanical force required, for any given distance - -	1	4	9	16

"From this we find, that, when the rate of speed is about two miles an hour, the quantity of goods which a horse will convey upon a canal is three times that which the same horse can convey upon a railroad; and that, when the velocity on each is about 3½ miles an hour, the resistance of the canal increasing as the square of the velocity while that on a railroad remain the same, the two become equal; and a horse is then enabled to drag as much weight upon a carriage on a railroad, as in a boat on a canal. When the velocity is further augmented, then the disproportion become greater, and a much heavier load can be conveyed on a railroad, with the same intensity of motive power, than can be done on a canal.

"If, therefore, the rate of tonnage on a canal, arising from the cost of forming and keeping it in a state of active use, together with the cost of boats, be not greater than the tonnage required to form and keep a railroad in repair, and also the carriages by which the goods are conveyed; then the relative economy at different rates of speed, in the transit of goods upon canals and railroads, will be represented by column nine of the preceding table. But as, in general, the formation of a canal costs about three times as much as the formation of a railway, and the annual charges of keeping the boats, towing paths, and bridges, &c. in repair, is also considerable, if those expenses be as much greater with a canal than upon a railroad, so that they will compensate for the extra advantage of the canal in the greater quantity of goods conveyed at a slow rate, then their relative utility will assume a different appearance, and the railway, as requiring a less investment of capital, and less annual charges, may be superior even at the lowest and most advantageous rate of motion upon canals; and, where facility or expedition is an object, then at the more rapid rates of speed the railway will be proportionably superior.

"These, however, being matters of calculation, where every instance may present a different conclusion, and depending upon all the various concomitant circumstances incident to each particular case, cannot, in a work like this, be made the subject of *even conjecture.* I have endeavored to furnish all those data which appeared general, and which applied to the two modes in conjunction with each other, in a practical and general point of view. It must be left to those acquainted with all the circumstances of each particular case, when they come into competition with each other, to judge, *from the individual situations, which of the two is preferable.*

"When it becomes a subject of discussion, which of the two modes are to be adopted, it assumes rather a different shape than when a railroad is to enter into competition with a canal already formed. *In the latter case, the canal proprietor commences with considerable advantage by the additional quantity of goods which a horse can drag at a slow pace upon a canal, where perhaps a little loss of time may be no object;* the canal proprietor may, *even with his great investment of capital, by reducing his rates of tonnage extremely low, be enabled to compete successfully with a railway.*

"For although a horse may, when travelling at the rate of four or six miles an hour, convey a greater quantity of goods upon a railway than when employed in dragging goods at the same velocity upon a canal, yet still a horse cannot drag more goods at the rate of four miles an hour upon a railway, than he can at two miles an hour upon a canal; for in no case does the greatest quantity of work that a horse can do, at the most beneficial pace on a canal, *reach below three times that,* which a horse can do, at any pace upon a railroad.

"For the conveyance of passengers, or where the transit of any species of goods may require a celerity of four miles an hour, then railways become unquestionably more economical than canals; but *if the question be the abstract performance*, or *quantity of goods to be transported* from one place to another, *without reference to speed*, then *the canals will at all times have a superiority over railroads*, in point of *quantity of work* done by a horse, in the proportion of 3 : 1. The comparative expense arising from the extra interest of capital, and the annual charges and maintenance of a canal, may reduce this proportionate performance near to an equality; or, if the one compensate for the other, then perhaps the less investment of capital in a railroad, and the greater certainty of transit, may make it superior to a canal; but, unless the disparity of cost is great between a railroad entering into competition with an existing canal, or unless some extraordinary circumstances in the nature of the traffic occur, it may be difficult to say, when horses are the motive power on each, which is superior." (Wood on Railroads.)

The writer in England on the subject of railroads, next in celebrity to Wood, is Tredgold, a member of the institution of civil engineers, whose treatise was re published in New York in 1825.

"In discussing," he says, "the merits of railroads, we have to compare them with turnpike roads and with canals. Railroads give the certainty of the turnpike road, with a saving of seven-eighths of the power; one horse on a railroad producing as much effect as eight horses on a turnpike road. In the effect produced by a given power, the railroad is *about a mean* between the turnpike road and a canal, when the rate is about three miles an hour; but where greater speed of conveyance is desirable, the railroad equals the canal in effect, and even surpasses it." (Page 3, of the New York edition.)

"When it is attempted to compare railroads with canals or common roads, it must be obvious that each mode has its peculiarities: the same may be said of each line of traffic." (Id. page 8.)

"Both the first cost and the annual repairs of a canal exceed those of a railway; the excess differing according to the nature of the country. But in a country suited for a canal, the difference of first expense *is more than compensated by a greater effect produced by a given power on a canal than on a railway, provided the motion does not differ much from three miles an hour, and this renders a canal decidedly better for a level district.* On account of the resistance increasing in the ratio of the squares of the velocities, when bodies move in fluids, and also *on account of the injury the banks* would suffer by too rapid a movement of the water, the velocity of canal boats must be considered as limited to a speed not far exceeding that which they obtain at present; but on a railway, a greater velocity may be obtained with less exertion, even where animal power is employed." (Id. page 9.)

"The average cost of a proper railroad, with a double set of tracks, will not be less than £5,000 sterling (or 22,222 dollars) per mile, when all the expenses in our list are included, and the works are done in a good and substantial manner." (Id. p. 141.)

The Liverpool and Manchester railroad, thirty two miles long, is known certainly to have cost three times that sum, and rumor makes it nearer six times.

"From a list of estimates for no fewer than seventy-five canals, including

those of the greatest and least expense, a writer in the Quarterly Review, No. 62, p. 363, draws a general average of £7,946 (35,280 dollars) per mile; but it is well known that these works have rarely, if ever, been executed for the estimated expense." "The Union canal cost £12,000 (52,280 dollars) per mile: the Forth and Clyde, £12,400" (54,056 dollars.) (Id. p. 143.)

"The average cost of a canal may be estimated at £10,000 per mile," (44,444 dollars.) (Id. p. 143.)

"Smeaton informs us that twenty-two tons burden, at from two, to two and a quarter miles per hour, is the work of a horse on a canal And Mr. Beavan has informed us that the horses on the Grand Junction canal usually travel twenty-six miles per day, and draw a boat containing twenty-four tons at the rate of 2.45 miles per hour; the empty boat being nearly nine tons, the whole mass moved is about thirty-three tons; and the average force of traction he found to be eighty pounds." (Id. p. 150.)

TABLE V.

A TABLE showing the effects of a power or force of traction of one hundred pounds, at different velocities, on canals, railroads, and turnpike roads.

Velocity of motion.		LOAD MOVED BY A POWER OF 100 LBS.					
		On a canal.		On a level railway.		On a level turnpike road.	
Miles per hour.	Feet per second.	Total mass moved.	Useful effect.	Total mass moved.	Useful effect.	Total mass moved.	Useful effect.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
2½	3.66	55,500	39,400	14,400	10,800	1,800	1,350
3	4.40	38,542	27,361	14,400	10,800	1,800	1,350
3½	5.13	28,316	20,100	14,400	10,800	1,800	1,350
4	5.86	21,680	15,390	14,400	10,800	1,800	1,350
5	7.33	13,875	9,850	14,400	10,800	1,800	1,350
6	8.80	9,635	6,840	14,400	10,800	1,800	1,350
7	10.26	7,080	5,026	14,400	10,800	1,800	1,350
8	11 73	5,420	3,848	14,400	10,800	1,800	1,350
9	13.20	4,282	3,040	14,400	10,800	1,800	1,350
10	14.66	3,468	2,462	14,400	10,800	1,800	1,350
13.5	19.9	1,900	1,350	14,400	10,800	1,800	1,350

"TABLE V.—This table is to show the work that may be performed by the same mechanical power, at different velocities, on canals, railroads, and turnpike roads. Ascending and descending by locks on canals may be considered equivalent to the ascent and descent of inclinations on railroads and turnpike roads. The load carried, added to the weight of the vessel or carriage which contains it, forms the total mass moved; and the useful effect is the load. To find the effect on canals at different velocities, the effect of

the given power at one velocity being known, it will be as $3^2 : 2.5^2 :: 55,500 : 38,542$. The mass moved being very nearly inversely as the square of the velocity.

"This table shows, that when the velocity is five miles per hour, it requires less power to obtain the same effect on a railway than on a canal; and we have added the lower range of figures to show the velocity at which the effect on a canal is only equal to that on a turnpike road. By comparing the power and tonnage of steam vessels, it will be found that the rate of decrease of power by increase of velocity, is not very distant from the truth; but we know that in a narrow canal the resistance increases in a more rapid ratio than as the square of the velocity: only we have not time to spare to follow up the inquiry at this moment. Other tables of a similar kind have been published, and we find our column exhibiting the useful effect on canals nearly agrees with that of Mr. M., the ingenious author of a series of essays on the subject, which first appeared in the Scotsman; but we differ respecting railways, his being more in favour of railroads. From Mr. Sylvester's table this differs very considerably: he has underrated the effect on canals as much as he has overrated the effect on railways and common roads."

It is proper to remark, that from Tredgold, as from other English treatises on railroads passages may be extracted less favorable, than the preceding, to the superiority of canals: but enough is here quoted to show the uncertainty which hung over the question, whether canals or railroads were to be preferred for the transportation of persons and property. No two authors, scarcely, will be found to concur precisely in opinion on the subject, nor the same author with himself.

The knowledge possessed by the founders of the Baltimore and Ohio railway of the superiority of railroads, to canals, was comprised in the pamphlet detailing these proceedings, from which, copious extracts have already made part of note N.

It is there introduced in the following language of the report of their committee, beginning on the 7th page of the proceedings:

"The stock of information upon the general subject of railroads, now in the possession of the committee, is admitted not to be very extensive, but they have gleaned from the several publications and reports which they have examined upon this interesting subject, enough to leave no doubt upon their minds, that these roads are far better adapted to our situation and circumstances than a canal across the mountains would be: they therefore recommend that measures be taken to construct a double railroad between the city of Baltimore and some suitable point on the Ohio river, by the most eligible and direct route, and that a charter to incorporate a company to execute this work be obtained as early as possible; and in support of this opinion, they submit the following views and statements."

Among these statements, which are all from books and pamphlets in common circulation, is the following:

"The proprietors of the *few* canals which do answer will have the greatest reason to complain, (that is, of the introduction of railroads;) but they must, of course, submit to any superior method of improving the conveyance or transport of merchandise, just as the common coasting traders will to the established steam vessels; with respect to those canals which do not answer, and those that never can, the sooner they are abolished in toto the better." (Gray, p. 66.)

"The expense of forming railways is not only far less than that of canals,

but the former exhibit the peculiar advantage of a better conveyance than roads and canals conjointly afford at present." (Gray, p. 67.)

"The mode of conveyance that most nearly assimilates to railways is canals; but to them, *the agency of steam cannot be available*, as they are *limited to the size of their loads*, and, as regards utility, to the speed of conveyance; for to draw a load of forty or fifty tons with double the speed that is now done by one horse, could not be effected on a *common canal* by any power that can be applied." (Jessop in Gray, p. 103.)

A railway can, according to circumstances, be made at from a half to a *fourth of the expense of a canal*, and convey goods more cheaply, which would render them lucrative when any other mode would be ruinous." (Idem in Gray, p. 104.)

"Railways may be constructed at *one-fifth of the expense of canals;* and as it has been shown that they will convey as cheaply, where the prospect of remuneration to the adventurer in one case is doubtful, the *lesser expense* makes the other *certain.*" (Gray.)

Whether these essayists merited all the confidence reposed in them, experience has already determined, in the relative cost of the construction of a considerable part of that very canal, denounced as affording *too tardy, circuitous*, and *expensive* a route to the Ohio, and to the *actual cost* of a correspondent part of a railroad from Baltimore towards the "Point of Rocks,"—a canal exceeding greatly, in dimensions, as well as in the difficulty of its construction, any canal in England, and surpassed in breadth, by but one in Great Britain, compared with a railroad of two tracks only.

At the moment of the publication of this pamphlet, it had been ascertained that the railroad between Manchester and Liverpool, of four tracks, in length not thirty-two miles, and surmounting an elevation of less than 150 feet, would exceed in cost sixty thousand dollars a mile! Its actual cost has surpassed, it is currently believed, the double of that sum.

That the cost of the Ohio canals has not exceeded 11,000 dollars per mile has already been noticed, as well as the computed cost of the Erie canal of New York, which has, in fact, been less than 18,000 dollars the mile; its price was made to reach 23,000 dollars, by the addition of interest on loans: which have no relation to the contract prices of the works of a canal, and depend, for their necessity and their terms, on the wealth, or credit of the borrower.

The conclusion, that permanent railroads, of several tracks, cannot be constructed at one-fifth of the expense of canals, may be farther confirmed by reference to the cost of the canals of Pennsylvania, New Jersey, and Connecticut. The eastern section of the Chesapeake and Ohio canal is expected to cost from 25 to 27,000 dollars the mile; but a canal of such dimensions should be compared with no railway of less than four tracks; and the rails alone of such a road would probably cost more than that sum, exclusive of the graduation of the road.

The greater part of the extracts from treatises on railroads, made by the Baltimore committee, (in 1827,) were, as we have seen from a work entitled "Gray's Observations on a General Iron Railway," the fifth edition of which, was published in 1825.

The following extracts from the very same work, show the importance of having presented both sides of the question, now made between the advantages of canals and railroads.

"In order," says Gray, in examining the same authority, "to establish a general iron railway, it will be necessary to lay down *two* or *three* rail-

ways for the *ascending, and an equal number for the descending vehicles.*" (Page 12)

"In the immediate neighborhood of London, the traffic might demand six railways" (Page 12.)

"It is desirable to show the probable expense of this scheme, but this depends almost entirely upon the state of the country through which it may be found necessary to pass."

"Wagons laden with merchandise can never expect to proceed with the same velocity as coaches." (Page 12, 13.)

"By the second extract it will be seen, that the sums quoted as the expense of railways, vary too much to be depended on." (Page 13.)

"Mechanic power, when once put to the test, by comparison on land and water, will, *no doubt*, prove more favorable by the former, in proportion as that element is *more stable*, and not under the influence of *wind, tides, or currents.*" (Gray's Observations, &c.)

And from the appendix to the above edition of this work, the following passages merit attention: "On the whole, then, it may be concluded that, on a level team-road, making allowance for the weight of the wagon, one horse will be required for every four tons of coal, or other articles conveyed; and, on an edge railway, one horse will be required for every seven tons. On an ordinary canal, one horse, with a boat, will be sufficient for eighty tons. But the first cost of a canal is three or four times greater than that of a railway; so that, in some cases, *it may become a question*, whether a railway might not be adopted with advantage." Page 178.

"The public in general entertain wrong impressions respecting railways; they never hear them mentioned, without recurring to such as are seen in the neighborhood of coal pits and stone quarries. But such improvements have taken place, that they are no longer the same thing; besides which, a railway *without a locomotive engine*, is something *like a cart without a horse, a trade* without profit, or a *canal without water.*" (Page 184 and 185.)

"On a canal, a horse, travelling at two miles an hour, draws 30 tons, in a boat weighing probably 15 tons. Reducing the ton to 2,000 pounds, for the sake of round numbers, as in the last calculation, we find here that a power of traction of 100 pounds moves a mass of 90,000 pounds, or the resistance which the water opposes to the motion of the vessel is equal to one nine-hundredth part of the load or entire weight. At sea, where the water is of unlimited breadth, the resistance probably is one-third less."

"We see, then, that the effect produced by the draught of a single horse is ten times as great upon a railway, and thirty times as great upon a canal, as upon a well made road; yet a railway costs only about three times as much as a good turnpike road, and a canal about nine or ten times as much." "With regard to the comparative advantages of canals and railways, *so far as the present facts go*, we may observe, that, if a horse power effects three times as much upon a canal as upon a railway, the canal costs about three times as much, and will of course require nearly the same rates or dues per ton, to make the capital yield the same interest." (Pages 206 and 207.)

"Railroads, as hitherto worked by horses, *possess very little*, if any, *advantage over canals;* but railroads worked by the locomotive steam engine, have so decided a superiority, both as it regards time and expense, that there can be no question but they will be generally adopted wherever a new line of conveyance has become necessary, either *from an increased trade*, or from the *exorbitant demands of canal proprietors.*" (Page 185.)

Here is the true secret of the imputed superiority of railroads, to canals, in England: the former are designed to break down a very lucrative monopoly, which had, in some cases, when this author wrote, swelled the profit of certain canals so high, that, on that of the Trent and Mersey, as he informs his readers, £75 was the annual dividend on a single share of £100 original cost, which was selling in December, 1824, at £2,300 advance on the £100; yet this canal has three tunnels, one of 2,880 yards, and another of 1,241, in 22 miles, and two aqueducts, of which, that over the river Dove has 23 arches.

The appendix of the work, from which the above quotations are made, speaking of *another canal*, that between Birmingham and Liverpool, avers, as an argument for breaking down, or dividing, by means of a railroad, *its* long uncontested monopoly, that the original shares had risen from £140 sterling to the sum of £2,840; and adds: "These facts on the increased value of this canal, which exceeds twenty times its original cost, prove, also, that the public transits might have been performed at much cheaper rates, and yet the company obtain an adequate remuneration."

The tolls on the Chesapeake and Ohio canal are not only limited to two cents per ton per mile, but the profit on any possible amount of tonnage, *to 15 per cent. on the capital expended.* The freight for carriage, left by law to be reduced by open competition on the public highway, which the canal affords to every boatman who may please to use it, the experience of the Lehigh navigation, demonstrates, on a smaller canal, will not exceed one cent per ton per mile.

The Baltimore and Ohio Railroad Company, on the other hand, are allowed to charge for toll and transportation, from west to east, four cents per ton per mile, from east to west six cents; and their charter allows them to be the exclusive carriers, with no other limitation to the extent of their future profit.

The exclusive advocates of railways insist, that the resistance of water to the motion of a canal boat increases, at every addition to its speed, in the ratio of the square of its velocity. Be it so. A single horse can draw, in a boat, on a canal, at the rate of two miles an hour, (the Appendix to Gray affirms, page 206,) 90,000 pounds; consequently, at four miles an hour, he could draw but the one-fourth of that weight, or 25,000 pounds; but at one mile an hour, he could draw 360,000 pounds; and at half a mile an hour, the enormous weight of 1,440,000 pounds. Thus a single horse draws, on the large canal between Amsterdam and the Helder, a ship of several hundred tons. On the Champlain canal, a gentleman met a raft of timber so united by a single plank, with a pivot for each lockhole of the long raft, that one horse drew it with facility at the rate of a mile an hour. It was from the lake, and then on its way to Albany; its computed weight was 200 tons, and the horse had drawn it the entire length of the Champlain canal. What velocity, and how many railroad cars would be required to balance the economy of this transportation? Yet a full moiety of the revenue of the New York canals is derived from the productions of the forest, in their rudest form. Would any contemplated speed of a carriage on a railway, which, at most, could but save the interest of a few days or hours on their small capital vested in this vast moving mass of wood, countervail the cheapness of this slow voyage?

One great advantage attending the canal on which it was drawn is, that the swiftest packet boat, in meeting or overtaking such a raft, can pass it by,

without the least obstruction, or a moment's delay. On a canal 60 feet wide, the tracks are never impeded by heavy carriages.

The numerous English authorities in favor of the superiority of railroads, in a country where there are, as yet, very few railroads, and there have long been more than one hundred canals, are contradicted, as we have seen, by American engineers, of at least equal merit, who, considering the very wide field which the United States present for both species of improvement, cannot be suspected of undue partiality for either.

But the disproof of the arbitrary and most extraordinary assertion of these British writers, that canals are attended, in their construction, with three, and even four times the cost of railways, does not rest on mere authority.

The actual experience of both countries has now settled this question, provided the cost of the only railroad in England, adapted to an active exchange of commodities, or exceeding a few miles in length, be assumed, as the measure of the expense of such structures, on that side of the Atlantic.

On turning to the numerous facts, developed by the past experience of both Europe and America, an impartial engineer will infer, amidst their seeming contradictions, some principles calculated to guide his judgment to a sound conclusion, as to the original cost, the annual repairs, and expense of carriage of these two rival modes of internal improvement. Let these principles be then applied so as to determine the relative cost of a canal and railroad over every description of ground.

The most favorable ground, for any railroad, would, obviously, be that which required no graduation or masonry; or which, in its natural state, was ready to receive the rails.

Supposing a double track of these to cost no more, when laid on stone sills, than the first thirteen miles of the Baltimore and Ohio railway, which led to excellent granite quarries, it is obvious that the cost of such a road, over such ground, would be, at least, $13,000, or, if the rails be laid on wood, not less than $10,000, per mile.

Assuming a surface of country, alike favorable for a canal, we have to look, for the elements of a just calculation of its cost, to its plan and dimensions.

A canal of the dimensions and plan of the Erie canal of New York, of the canals of Ohio, and of the canals, in general, of Pennsylvania, having a breadth, at the surface, of 40 feet, at bottom of 28 feet, and four feet depth of water, with a tow path 9 feet, and a berm bank 5 feet wide, will require an excavation, in level ground, of $2\frac{94}{100}$ feet cutting, in order to supply the necessary quantity of earth for its embankments.

The cross section of the excavated prism of such a canal being $95\frac{28}{100}$ square feet, the number of cubic yards of earth to be excavated in one mile of it, would be $95\frac{28}{100} \times 5280$, the number of feet in a mile, divided by 27, the number of cubic feet in a cubic yard, or $18.632\frac{53}{100}$ cubic yards.

If this canal be required to be enlarged to the dimensions recommended for the Chesapeake and Ohio canal by the United States' Board of Internal Improvement, in their report of October, 1826, that is, to 48 feet at the surface, 33 feet at bottom, with 5 feet depth of water, and embankments of the height or breadth of the former, its depth of cutting, in the same ground, will be the same as in the last case, or $2\frac{94}{100}$ feet. The prism of earth to be excavated to form its embankments will have a cross section of 110 square feet, and will contain $20,770\frac{37}{100}$ yards.

If this canal be extended to the size of that, 48 miles of which are already constructed in the valley of the Potomac, between Washington and the "Point of Rocks," that is, to a breadth, at the water line, of 60 feet, at bottom of 42 feet, with a towing path 12 feet, and a berm bank 8 feet broad at top, elevated two feet above the water, and having moderate slopes towards the bottom, then, the necessary depth of cutting will be $3\frac{24}{100}$ feet, the cross section of the ex-prism will be 157 feet, and the number of cubic yards to be excavated, $30,700\frac{22}{100}$.

The price of the excavation will depend on the quality of the earth. But that being supposed in this case to be such, as is ordinarily encountered where neither hard pan, slate, nor rock is in the way, $9\frac{9}{10}$ cents per cubic yard may be taken for the measure of its excavation, that being found to be the average rate of such excavation, throughout the entire Chesapeake and Ohio canal, for a distance of 48 miles. So that, if these three canals be charged with the same price, per cubic yard, for their excavation, the narrow and shallow, as the wide and deep, which, for the first and second, would be a very unfavorable estimate, then the canal, 40 feet wide and 4 feet deep, would be completed for $1,845 the mile; the canal, 48 feet wide and 5 deep, for $2,056; and the largest for $3,040 per mile.

If these several sums be compared with the lowest estimated cost of a railway, of two tracks, laid on stone sills, the ratio of the cost of such a railroad, to that of the smallest of these three canals, is as $13,000 to $1,845 or near 7 to 1; of the 2d, as $13,000 to $2,056, or near $6\frac{1}{3}$ to 1; and, of the largest, as $13,000 to $3,040, or near $4\frac{1}{4}$ to 1.

Such, therefore, is the proportional cost of the cheapest practicable canals, of the above dimensions, when compared with the cheapest practicable railroad of two tracks, laid on stone sills, where stone is very convenient.

But it may be truly said, that it is very rarely, if ever, that a canal passes over ground, as favorable as that assumed above. To this, it may be as truly replied, that a railroad can, as rarely, be constructed, without any graduation whatever of the surface of the earth, or any expense of masonry. Of the actual canal, along the Potomac valley, already constructed, the cheapest mile, as will be seen in the second table of the third annual report, consists of the 46th and 47th sections, on both of which there was paid an extra price for the transportation of part of the earth forming the embankments. This mile cost $4,064, or less than a third of the cost of the cheapest mile of two tracks, upon stone sills, of the Baltimore and Ohio railroad, allowing nothing whatever for its graduation or masonry.

If this comparison, although founded on actual experience, be objected to, on account of its assuming, as its basis, the most favorable ground, both for canals and railroads, then, let the most costly mile, on these two lines of communication, be compared; and, although the disparity will be by no means, so great, the dearest mile of this large canal, consisting of its 17th and 18th sections, in which an ascent of 48 feet is overcome by six locks, costing about $10,000 each, will be found to have been less expensive, by 35 per cent., than the mile composed of the 4th and 5th sections of the first division of the Baltimore and Ohio railroad, or the single mile a short distance to the west of the former, consisting of a part of the 8th and the 9th section of the same division of this road.

If a series of connected miles on the railroad and canal be preferred for the terms of this comparison, let the 13 miles composing this first division of the former, be compared with any thirteen consecutive miles of the most

expensive part of the canal, and the railroad will be found to have cost more than the canal, in the ratio of near 4 to 3.

If, however, this be also objected to, because of the great cost, so far, of both works, take the corresponding and cheapest portions of these, after climbing the granite ridge pierced by the Potomac and Patapsco rivers, as from the 38th section of the canal, up to the "Point of Rocks," being a distance, along the Potomac, of 47 sections, making, together, 24 miles. The cost of the grubbing, excavation, embankment, puddling, walling, and extra work of the 24 miles, amounts to $285,960, or $11,876 50 cents a mile; to which, adding for a granite aqueduct, of 7 arches of 54 feet span each, across the river Monocacy, costing singly $96,000; for 30 culverts and 3 cut stone locks, with their appurtenant houses, in all, $171,847, or an average of $7,160 03 cents a mile; and the average cost of the 24 miles will be $19,036 53 cents, exclusive of such contingencies as are applicable to both works. Allowing, for these, ten per cent., they will swell this average to $20,940 18 cents per mile. Of this cost, but a very inconsiderable part now rests on mere estimates, the work, except the Monocacy aqueduct, having been very nearly completed at the date of the annual report, from which the basis of this calculation is derived.

Recurring, in like manner, to the last annual report, made by the President and Directors of the Baltimore and Ohio Railroad Company, it will be found, that, allowing nothing for the necessary fixtures to surmount the inclined planes at Parr's ridge, for neither toll-houses, nor depots, nor for the cost of a wooden instead of a stone bridge across the Monocacy river, near which, it seems, there is no stone; nor for the fact that five-sixths of the whole of this part of the railroad is hastily laid on wooden sills, it is stated in this report, distinctly, that its graduation and masonry alone will cost $8,532 16 the mile, for the distance of 54⅝ miles, and that the other charges will amount to $11,628 per mile, if computed at the average cost, per mile, of a double set of tracks upon the entire stem of the road, 37½ miles, and of a single track, on the lateral road to Frederick, of 3½ miles, being one-third laid with stone rails, (i. e. including the first division of 13 miles,) and the remaining two-thirds, of wood.

From the one-third laid on stone sills, should be deducted the 13 miles next to Baltimore, leaving, out of the entire 58 miles above Ellicott's mills, including the single track to Frederick of 3½ miles, but about 9 miles, or one-sixth of this road laid on stone sills.

Adding the $11,628, which is somewhat more than the average cost of a double track on wooden sills, to the $8,532 16, the average cost allowed for graduation and masonry, and the sum total of the cost per mile of this road, is $20,160 16. But if the expense of fixtures at Parr's ridge, estimated at $40,000, in another part of this report, be added, and, with it, the further cost of toll-houses and depots, this average will be swelled to a sum exceeding, without any allowance for contingencies, the cost per mile of the canal; and let it be remarked, that, of this average cost, a large proportion is founded on mere estimates of expenses yet to be incurred. If a due allowance be made for a bridge of stone arches over the Monocacy, instead of a wooden superstructure, and for the substitution, hereafter, of stone, for wooden sills, where stone is said to be difficult to be procured, and for contingencies also, the railroad will be found to exceed the canal, in cost, by near the same per centage, on the more easy, as on the more difficult parts of the routes of the two works. Nor should it be forgotten, that this last comparison is of a railroad

through an open country, allowing a choice of way, for a work not confined to a certain inclination in the mile; while the canal must, of necessity, hug the parent of its existence, the Potomac river, and cross all its tributary streams where widest and deepest, because near their mouths.

When the railroad shall have entered the valley of the Potomac, and encountered the same disadvantages with the canal, its masonry as well as its graduation, will rise in cost, much beyond the estimate here admitted.

So much for the relative cost of these works, which, for many reasons, are not to be assumed as a standard to measure the relative cost of all railroads and canals. The canals of New York cost about 18,000 dollars a mile, those of Ohio have cost very little more than 11,000. The Farmington canal, in Connecticut, cost less than either. The canals of Pennsylvania will cost less per mile than her railroads. The disparity would have been greater, but for moral or *political* rather than physical causes.

To proceed with the second object of inquiry, the cost of transportation on railroads and canals.

The amount of tolls and the cost of transportation on the Baltimore road and the Potomac canal, are regulated, to a certain extent, by the provisions of their respective charters. The railroad being a close monopoly, and not a public highway, like the canal, the transportation, as well as the tolls upon it, is left with the company, which is required not to exceed 4 cents per ton, per mile, in its charge on the tonnage moving eastwardly; nor more than 6 cents on that moving westwardly. The canal tolls are limited, in both directions, to 2 cents only, per ton, per mile; and the charge for transportation on the canal, if its trade be active, in both directions, will probably be reduced by competition to one-third of a cent a ton; but under no circumstances, will it exceed one cent a ton, per mile. So that, by the permission of their charters, the Railroad Company may charge 33⅓ per cent. more for toll and transportation one way, and 100 per cent. more the other way, than the Canal Company. If, however, departing from the limitations of their charters, these two companies were allowed equal nett profits, then the relative magnitude of the burthens which they would impose on the people, supposing that profit to be equal, and their tonnage too, would depend, as stated in a former note, on the relative cost of their works, their relative repairs, and their rate of transportation. If the relative cost of the construction of the canal and road be the same, then, on their respective annual repairs and rate of transportation. Now, the lock gates are almost the only perishable parts of a canal constructed of such materials, as compose that, now passing up the valley of the Potomac. Its very wide and solid embankments of earth, often paved with stone, its massy walls, its locks, culverts, and aqueducts of durable freestone or granite, united by hydraulic cement, will be strengthened, rather than impaired by time. While every part of a railway exposed to the action of the weather, to the constant attrition of heavy cars, and heavier locomotive engines, moving with great velocity, and alike injurious to the road and its carriages, to say nothing of its wooden sills, for two-thirds of its route, or of its aqueduct of wood across a considerable river, is liable to gradual, though certain wear, and to ultimate destruction or continual repairs, from the very use which constitutes its profit.

Although the late report of the President and Directors of the Baltimore and Ohio Railroad Company forbears to include the repairs of any part of their road, or of their cars, among the expenses involved in the collection of nine

months receipts, the suggestion in their report of their chief engineer, that "the durability of the road," to use his own language, "and of the cars, and especially of the wheels, would be promoted by the use of springs;" and again, that "the concussions upon the rails are very considerable, and are greatly augmented by an increase of the rapidity of the movement," would indicate that some expenses, from these causes, had been already incurred, and should be considered as involved in the receipts.

To diminish such expenses, the Liverpool and Manchester Railroad Company are said to employ several hands, with brooms and scrapers, for every mile of their road, to cleanse it of dust, an expense which the cheaper labor of England may possibly enable their road to bear; but which would, of itself, much detract from the profit of any railroad, even amidst the most crowded population of America; to say nothing of the solitudes of the Alleghany and its parallel ridges.

Some of the British authorities in favor of the superior economy of railroads, were invoked to their aid by the Baltimore and Ohio Railroad Company, in their early appeals to the public, and have been more recently quoted with approbation by their chief engineer; but they do not appear to have been sustained by the progress of that enterprise, either as regards the comparative cost of the road itself, or the comparative cheapness of its transportation.

Of the last, we have not been allowed to judge at all; since two essential ingredients of any just estimate, are singularly omitted from the late annual report of the President and Directors, viz: *the cost and repairs* of the necessary carriages; and *the wear and tear*, or repairs of the road itself.

If the acknowledged expenses of transportation bear the same proportion to those which are omitted, that the experience of other railroads in America, warrant the belief, then, it is more than probable, that a just comparison of the receipts and disbursements of this company for nine months of the present year, would bring them in debt; since "the moving power, drivers and engine men, agents and conductors, depot expenses, oil, and" certain "contingencies," &c., (amounting to 482 dollars,) required an outlay of very near 11,000, out of the gross receipts of 31,405 dollars, being, as the Superintendent says, "of 1 to 2.86." Computing the 81,905 passengers on this road, who were attracted to it, mostly as Mr. Woodville, the Superintendent, states, "by novelty or amusement," at the usual allowance of 12 persons to a ton, and the entire tonnage of the nine months use of this road, between Baltimore and Ellicott's Mills, or for 13 miles, is about 12,750 tons.* Of this, the greater part of the passengers, amounting to 6,825 tons, travelled out and in, or about 26 miles; the commodities, 5,931 tons, it is presumed, in no instance, more than half that distance, or 13 miles. The whole operation, therefore, is equivalent to the carriage of 254,553

* The Superintendent makes the total tonnage, no doubt, more correctly, "amount to upwards of 1,100 tons per month;" which, allowing for the indefinite form of expression, could not be supposed to swell the aggregate for the nine months much, if any thing, beyond 10,000 tons. If so, the calculation here made is more favorable to the economy of this road than it should be, by more than 25 per cent., so far as the expense of the moving power is involved in it. He also expressly says, that under the head of expenses of "transportation, he does not include any charges for the construction, the repairs, or the wear and tear of wagons and cars; that branch of the service being under the immediate care and superintendence of a committee of the board," who, it appears, have excluded any notice of it from the text of the report, and have not thought proper to say any thing about it in its voluminous appendix, making together, a work of more than 130 pages.

tons a single mile; and the charge of $10,994 87 cents, for the moving power exerted in 9 months, on this railroad, is more that 4⅓ cents a ton, per mile, totally excluding any allowance for profit or interest on the first cost of the road or car carriages, the repairs of those carriages, or the necessary repairs of the road in use.

Against this estimate, it might be said, with truth, that the transportation of persons requires a greater number of carriages than the transportation of commodities of equal weight, since these may be packed in a less compass. That a load of the former is more elastic, and, therefore, less injurious to the road. This objection is met by the greater velocity with which they are transported, the greater number of wheels which they bring in contact with the road, and its greater injury, from the friction of those wheels. On these considerations, is founded, no doubt, the higher charge for passengers.

Assuming 4⅓ cents per ton, per mile, to be the actual measure of that part of the expense, shown by the Superintendent of transportation on this road, to have been involved in the carriage of persons and property upon it, in the first nine months of the current year; and, adding, as is warranted by the report of the Superintendent of the Mauch Chunk railroad, $1\frac{16}{100}$ cents per ton, per mile, for the repairs of carriages; and, as the former road is of much better quality than his, only half a cent a ton, per mile, or one-half of his estimate, for its repairs, there will result 6 cents a ton, per mile, as the cost of transportation in an experiment of nine months, on the first 13 miles of the Baltimore and Ohio railroad, the materials of which were all new, and as perfect, as the expenditure of 60,000 dollars a mile, the cost of this part of the road, could make them.

The conformity of this *estimate*, which is by no means exaggerated, to the acknowledged cost of transportation, for the first six months of the same period, on the equally new, and much more costly, and it is presumed, more perfectly constructed Liverpool and Manchester railroad, greatly confirms *its* probable truth.

A brief transcript of the Mauch Chunk Courier from the annual report laid before the stockholders of the Liverpool and Manchester railroad, at their meeting in September last, gives, for the gross receipts on that road, for the first half of the present year, from the carriage of persons alone, £43,600 7*s.* 3*d.*; for merchandise, £21,875; and for coals, £218 6*s.* 2*d.*; making the total amount of gross revenue £65,693 13*s.* 7*d.*; from which, is to be deducted, the sum of £35,379, for the gross expenditure involved in the collection of this revenue, including an inconsiderable land tax, (the stock is free of all assessment, by the charter,) and a sum not stated in this transcript, paid for interest on an outstanding debt of the company. The nett revenue for the half year, was, as there stated, £30,314 13*s.* 7*d.*, on an investment of capital exceeding £800,000 sterling, or very near, it is believed, 4,000,000 of dollars, making due allowance for every thing, and including the difference of exchange between English and American currency.

Although neither the sum paid, as land tax, nor the interest included in the six months disbursements, is stated, in the extracts from this report here quoted, at second hand, they supply the following particulars, which answer the same purpose: That the actual receipts "for the goods carried," were equal to 10¼ shillings sterling, about 245 cents per ton, for the entire road of thirty miles, (stated in a late work to be 29¾ miles,) and that the expense chargeable, on their transportation, amounted to 7*s.* 7*d.* a ton, about 181¼ cents; leaving 2*s.* 8*d.* per ton, or 63¾ cents, as the profit on the stock of

the company, and making the total cost of transportation six cents a ton, per mile, on this new, truly magnificent, and, it is presumed, perfectly constructed railroad of two tracks, laid on a solid foundation of stone. The receipts for passengers, in gross, £43,600 7*s.* 3*d.*, amounted to 4*s.* 7¼*d.* each; and the expenses of their transportation to 2*s.* 6¼*d.*, making the nett profit, on *each passenger*, 2*s.* 7*d.*; or very near the same as on *a ton* of goods.

What, though not immediately connected with the present inquiry, is well worthy of notice, in passing along, is, that the receipts, for passengers, doubled the receipts for the transportation of property. That the total sum received for the latter, indicates the whole tonnage of goods, for the six months, not to have much exceeded 40,000 tons, which doubled for the year, makes but a fourth of the tonnage of the Erie canal of New York; and that, this road, from the second sea port, to the largest manufacturing town in England, through a country abounding in coal, the source of the greatest revenue on the most profitable lines of inland navigation in Great Britain, yielded, in six months, for the carriage of this primum mobile of all the British work shops, but £218 6*s.* 2*d.*, sterling.*

* How small a part of the imports of Manchester through Liverpool is comprehended in these 40,000 tons, which comprehend the trade both to and from that sea port, will be the more apparent from the following description of the trade of the former, from the Edinburgh Gazetteer, published in 1822, vol. IV. p. 135.

"The greater part of the cotton trade of Great Britain centers in Manchester, extending around in all directions, to Furness, on the north and south, and to Leeds and Liverpool on the east and west." "The various branches of the manufacture are carried on more or less through all this district, but by far the most extensive, especially the spinning, in Manchester. Manchester is, besides, the general depot from which the raw material is distributed through all parts of the district, and in which all this scattered merchandise is again collected when finished, into a centre, to be again expanded over a wider circle."

"Though various causes have concurred to render Manchester a great emporium of manufactures, the foundation of the whole is unquestionably laid in the natural situation of the place, on the banks of a navigable river, in the midst of inexhaustible fields of coal, near the centre of the kingdom, and capable of having its external and internal communications greatly improved by art.

"By means of the canal which proceeds from it to different parts of the country, Manchester enjoys a communication by water both with the eastern and western seas, being situated directly in the line of navigation, which here extends across the island from shore to shore; while it is equally open to the north and south by various branches from the main trunk. The Irwell and Mersey form an easy access to Liverpool. The act for making these rivers navigable passed in 1720; and in 1755, this communication was still more facilitated by the famous canal of the Duke of Bridgewater, from the Duke's coal works to Manchester, and from thence to Runcorn, which at the same time, uniting with the grand trunk, or Staffordshire canal, extends the navigation southwards to the Trent and Severn, to Nottingham, Birmingham and Bristol.

"In 1795, 25 boats of 55 tons each, were employed on the Mersey and Irwell, plying between Manchester and Liverpool, and making 36 trips a year; and on the Duke of Bridgewater's canal there were 42 boats of 50 tons each, which made 80 trips a year." "The Leeds and Liverpool canal runs greatly to the north of Manchester." On the north, the Duke of Bridgewater's canal is prolonged by Leigh, to the Leeds and Liverpool canal, near the coal district of Wigan." Under the Liverpool head, vol. III. page 786, it is said, "The Duke of Bridgewater's canal, begun in 1761, had opened a communication to Manchester much superior to that of the Mersey and Irwell." Yet the annexed table, showing the value of the stock vested in the former navigation to be 5¼ times its original cost, and its dividend, 20 per cent., proves that though inferior in value to the public, it finds, no doubt, at cheaper rates of transportation, very extensive employment.

"In 1819 the *tonnage* of Liverpool was 867,318 tons, or more than that of the whole United States of America at the same period. The duties on *it* amounted to £110,127 1*s.* 8*d.* sterling.

The present object, however, for introducing the preceding facts, is to confirm, as they undeniably do, the estimates made by the highest American authorities, of the relative cost of transportation on railroads and canals, by reference to the most perfect railroad that has yet been constructed—it may be added, over favorable ground, in a country where manual labor is so cheap that it can be economically employed to sweep the road; where the arts have reached the greatest degree of improvement, and their ingenuity has been excited by high rewards, to invent and construct the most perfect locomotive engines; and where the coal which gives these engines motion, is so cheap as, under the obligations of a charter, to be sold seven miles from the pit, in the town of Manchester, at 3½*d.* for a bushel of seven score, which is at the rate of 2*d.* sterling for the Pennsylvania bushel, of 80 lbs. weight.

Ten shillings sterling, or about 240 cents, American currency, was the price to which the undertakers of this enterprise bound themselves to reduce the cost of transportation between Manchester and Liverpool, being, as has been shown, 8 cents a ton per mile. But the cost of this reduction is found to consume, *for carriage only*, rather more than three-fourths of this sum; or to exceed 6 cents a ton per mile; leaving but 2 cents a ton per mile to pay the interest on the capital invested in the road, and its necessary appurtenances; which falls little short of 4 millions, and may, possibly, be found to exceed that amount; allowing nothing for the interest lost during the six years' progress of this very heavy expenditure.

Here, again, is seen a verification of the results of the experience of the ingenious superintendent of the Mauch Chunk railroad; who, long since, informed the public, that while a velocity of fifteen or twenty miles an hour (which he then said could be extended to sixty) was very easily attained, and actually attempted on that railroad, such was the injury occasioned the cars and the road from such rapid motion, as to render the transportation nearly as costly as on an ordinary turnpike.

The description given by travellers lately returning from England, of the ruins of cars and rails scattered along the margin of the Liverpool and Manchester road, farther corroborates Mr. White's statement; although it is very evident that, while so large a proportion of the revenue of this railway is derived from the carriage of persons, they must be offered the attraction of quick motion and economy of time, to tempt them to pay the fare of five shillings for travelling on a railroad, the same distance, for which they would pay, on a canal, less than a moiety of that sum. Mr. Fairbairn states, in a work quoted in a former note of this appendix, that twopence a head would pay the expense of the mere carriage or trackage of persons, exclusive of tolls, through the fifty-four miles of canal navigation between Glasgow and Edinburg.

That so little merchandise is transported on the railroad from Liverpool to Manchester, between which, the water carriage used to be fifteen shillings sterling a ton, either by the Mersey and Irwell* navigation, or by the river

* The Mersey and Irwell navigation, above Runcorn gap, is mixed of still water, produced by dams and locks, and occasional canals.

A third line of navigation, though much more circuitous than either of the above, may also be said to connect Liverpool with Manchester. It is the Liverpool and Leeds canal, and the cut from Wigan by Leigh to Worsley mills, and thence to Manchester, by the first canal constructed by the Duke of Bridgewater, which now crosses the Liverpool and Manchester railroad, within a mile and a half of those pits whence, by the obligations of his charter, that enterprising nobleman was compelled to deliver coals at Manchester, distant seven miles from their entrance, at about four cents for the Pennsylvania bushel.

Mersey, for sixteen miles, and the Duke of Bridgewater's, now the Marquis of Stafford's canal, of twenty-nine and a half more, is, without doubt, to be ascribed to the breaking up of those profitable monopolies, and the recent reduction of the price of carriage on both those lines of water communication. But that, in this competition, the victory must ever remain on the side of the cheaper intercourse, by water, is evident, from two considerations: first, that on the same portion of any improved canal communication in America—and it cannot be less true in England—ninety cents would pay the reasonable toll, as well as freight, on the carriage of a ton of goods, for thirty miles; and 135 cents for a distance equal to the entire voyage of forty-five miles, from Liverpool to Manchester, by the circuitous route of the Bridgewater canal, and the river Mersey: and next, that the imposing, opening, and very near twelve months' use of this very costly railway, so far from reducing the antecedent revenue of the Mersey and Irwell navigation, has enabled its proprietors to recover from the panic of the years 1828 and '29, and to augment their dividend from 35, to 40 per cent., or to five per cent. beyond its extent ten years ago. (See the table, post.)

The price of their stock has, in that time, it is true, fallen, from 8¼ to 5¼ times its original cost. This depression may, also, be temporary; though, much for the public benefit, canals will, hereafter, be compelled, by the wholesome competition of railroads, to reduce those exorbitant profits which injudicious charters, framed without any limitation, but in the maximum rate of tolls, have hitherto allowed them.

It has been already noticed, that the charter of the Chesapeake and Ohio Canal Company, pursuing the policy of the act establishing the Virginia fund for internal improvement, limits the profit of their stock to fifteen per cent. per annum; a regulation, to which no just exception can be taken; for, while the profit of a canal will always be proportioned to the magnitude of its tonnage, its wear and tear, or annual outlay for repairs, will not. In this respect, as in so many others, canals have obviously great advantages over the best railroads; the repairs of which must be proportioned to their use, and increase with their gross revenue or receipts.

The last annual report of the Liverpool and Manchester Railroad Company confirms the preceding rumor, so extensively circulated in the United States, that the Bolton, Bury, and Manchester Canal Company, have obtained the consent of the British Parliament to substitute a railroad for their present canal.

To rebut the inference drawn from this solitary fact, to prejudice the American public against all canals, there is subjoined to this note a late essay from a public gazette, which, while it demonstrates the expediency of this substitution, as conclusively proves that no general inference can be deduced from it, to the prejudice of inland navigation, when compared with railroads.

Conclusively as the preceding facts, derived from the joint experience of England and America, appear to settle the relative merits of railroads and canals, it is probable that, while the present delusion on this subject, so generally pervades both countries, immediate assent will not be yielded to their force.

Canals can be constructed only where a sufficient supply of water exists to fill them. They must pursue the valleys of those rivers whose fountains feed them. Railroads, on the other hand, naturally seek the driest plains, avoiding, where practicable, watercourses and alluvial lands. They have

an ubiquity of locomotion which adapts them, if not to the real interests, to the illusory hopes of villages, towns, and cities, which no canal can ever be expected to reach; and those who advocate their exclusive use, know, full well, how to profit by this quality. Hence, a whole country may be set in commotion, by promises of railroads to intersect them in every possible direction. Such is the present excitement in the United States. Such has been recently, and perhaps continues to be, the excitement in England: such was the excitement, though it soon subsided, in the same country, at the time of the completion of the Croydon railroad, in the county of Surry.

This road was finished in 1802, under the eye, almost, of her great commercial and political metropolis; for its distance from the capital of the British empire is but eight miles; and it is crossed by the public highway, between London and Epsom, a village of no little note, for its periodical races, its mineral waters, and the beautiful scenery of its neighborhood.

Yet, a very short period ago, (less than two years,) no railroad stock had reached an advance of one hundred per cent. above par, in the English market; while the following were, at that time, the prices of the several canal stocks comprehended in the subjoined table.

The annexed table of the prices of canal and railway stocks, in the London market, at various times, is composed in part from the trade list of the day, which is published weekly by an assistant clerk of the bills of entry of the British customs, and may be, consequently, deemed to have an official sanction.

The table comprises only thirty-five, of more than one hundred canals, in Great Britain, and those the most profitable.

This table furnishes the best, because incontrovertible evidence, of the estimation of canal stocks, in England, at the several periods to which it refers, between March, 1821, and November, 1831.

DESCRIPTION and statement of the Prices of the Stock of

Names of the several Canals and Lines of Navigation.	Original cost of each share, in pounds sterling.	No. of shares.	Price of each share in 1821.*	Dividend on each share at that time.	Price of the same in March, 1828.	Dividend at the same time.	Price of each share in Jan. 1831. (Trade List.)
	£ s.		£	£ s. d.	£	£	£
Ardrossan	-	-	-	-	-	-	-
Barnesley	160	5,720	300	13	-	-	215
Birmingham	17 10	4,000	203	12 10	565	20	270
Bolton and Bury	250	477	-	-	-	-	106
Carlisle	50	1,600	490				
Chesterfield	100	1,500	150	8	120	8	170
Coventry	100	500	1,200	44	999	44	800
Cromford	100	460	400	19	-	-	420
Derby	100	600	150	7 10	-	-	130
Erewash	100	231	1,400	72	1,000	58	760
Forth and Clyde	100	1,297	570	25	-	-	600
Glamorganshire	100	600	250	13 12 8	-	-	290
Grand Junction	100	11,600	307	13	218	9	243
Grantham	150	749	215	9	-	-	210
Leeds and Liverpool	100	2,897¾	395	16	278	10	395
Leicester	100	540	325	17	260	10	220
Loughborough	100	70	4,000	200	2,400	119	1,800
Milton Mowbray	100	250	240	11	170	8½	200
Mersey and Erwell	100	500	825	35	650	30	600
Monmouthshire	100	2,409	215	10	-	-	239
Monkland	100	101	-	-	-	-	90
Neath	100	247	350	15	-	-	300
Nottingham	150	500	290	12	-	-	290
Oxford	100	1,786	670	32	640	32	500
Shrewsbury	125	500	210	10	-	-	250
Shropshire	125	500	135	7	-	-	140
Somerset Coal	50	800	170	10	-	-	166
Stafford and Worcester	140	700	800	40	642	40	760
Stourbridge	145	300	220	12	-	-	220
Stroudwater	150	200	450	23	-	-	480
Swansea	100	533	280	12 10	-	-	230
Trent and Mersey	101	2,600	820	37 10	900	75	620
Warwick and Birmingham	100	1,000	265	12	210	11	220
Warwick and Napton	100	980	205	12	235	10	220
Wyrley and Essington	125	800	160	6	-	-	115
Prices, at the same dates, of the Stock							
Liverpool and Manchester	100	5,100	-	-	-	-	181
Cromford, High Pt.	100	1,600	-	-	-	-	-
Canterbury	50	500	-	-	25	-	25
Cheltenham	100	330	-	-	78	-	78
Croydon	65	1,000	-	-	-	-	-
Jersey	60	1,000					
Severn and Wye	50	3,762	-	-	23	1 11	19 10
Forest of Dean	50	2,500	-	-	45	2 16	45
Stockton and Darlington	100	1,000	-	-	160	5	200
Monmouth	50	553					
Clarence	100	1,500	-	-		-	40

* Price in 1821, from the Monthly Magazine, transcribed from the Report of the Ohio "From the above it appears that canal stocks in England, of the medium original cost of worth £9,287, more than six times their original cost."

certain Canals and Railways in England at various periods.

Dividend at the same time.	Price of each share Nov. 1st, 1831. (Trade List.)	Dividend at the same time.	Length of each Canal, in miles.	Lockage, in feet.	Cost, in pounds sterling.	Date of completion.	REMARKS.
£ s. d.	£	£ s. d.			£	*Anno.*	
-	-	-	33½	170	253,000	1799	
10	210	10	14	120	97,000	1812	
12 10	244	12 10	22½	204	115,000	1772	
6	106	6	15	187	97,000	1797	
8	170	8	46	380	160,000	1776	
44	750	50	27	96	120,000	1790	
19	410	19	18	80	80,000	1794	
6	120	6	9	78	90,000	1794	
70	600	54	11¾	181	-	1797	
27	600	27	35	321	421,525	1790	
13 12 8	290	13 12 8					
13	235	13	93½	760	2,000,000	1805	
10	195	9	33¾	148	124,000	1799	
20	405	20	180	841	600,500	1774	
13 10	211	17	21½	230	84,000		
180	2,550	180	9½	41	-	1776	
2 10	190	2 10	-	-	-	-	Navigation.
40	525	40	-	-	-	-	Navigation.
12	208	12	17¾	1,057	275,330	1796	Inclined Planes.
-	90	-	12	96			
18	300	18	14	-	35,000	1798	
12	245	12	15	-	-	1802	
32	510	32	91½	269	330,000	1790	
11	205	11	17½	155	70,000	1797	
8	140	8	7½	453	47,500	1792	} Inclined Planes.
10 10	160	10 10	8½	138	185,000	1802	
36	555	36	46½	394	100,000	1772	
11	220	11	5	191	30,000	1776	
23	480	23	8	108	20,000	1796	
15	203	15	17½	366	90,000	1798	
37 10	620	37 10					
12	230	12	25	-	180,000	1799	
12	210	12	15	-	130,000	1799	
6	115	6	23	270	160,000	1794	

of Railways, in England.

-	205	8	29¾		800,000	1830	
-	20						
-	35						
-	78						
-	-	-	-	-	-	1803	
1 2	17	0 17					
2 10	33	2 4					
-	230	6					
-	65						

Canal Commissioners, of January 21st, 1824; to which they add the following remark:— £1,525, pay a medium dividend of £485, exceeding 31¾ per cent. per annum; and are now

Of the lines of water communication described in the preceding table, that of the Mersey and Irwell navigation, and one other, not included in the table, because its stock, the property of a single individual, (the Marquis of Stafford,) is not in market, are the channels of trade, with which the Liverpool and Manchester railroad enters into immediate competition throughout.

The extension of this railroad from Manchester to Leeds, and to London, would extend its competition to several other canals included in this table, as the Leeds and Liverpool, Grand Junction, Trent and Mersey, the Oxford; and to several others, less directly.

It is remarkable, however, that the prices of the stock of the canals nearest to Liverpool, have fallen less than those at a distance from it. While that of the Mersey and Irwell navigation had, in January last, sunk more than £300 on the share, its dividend, far from falling off, had risen 10 per cent. beyond that of 1828, and five above that of 1821. The price of its stock is still 5¼ times its original cost.

The Leeds and Liverpool canal stock, as well as dividend, had in like manner risen, the latter 4 per cent. since 1821, and 10 per cent. since 1828, when the railroad had inspired the greatest alarm, the former, after falling at this period, from £395 a share to 278, mounted up again, and was selling, on the first of November last, at £405 a share, or at four times its original price.

Of the thirty-five lines of improved navigation enumerated in the preceding table, the dividends of the stock of seventeen have been stationary, or very nearly so, for ten years past; six only have sustained any diminution; while as many have sensibly improved in value.

The Loughborough dividend, which was once £200 on the share of 100, and had fallen to 119, had, at the last accounts, again risen to 180, and its stock, which had exceeded £4000 the share, and fallen at one time to 1800, was, in the last month, at £2550 the share.

Although all the canal stocks in England have been affected more or less in the estimate of their value by the expected application of steam as the propelling power of railroads, and the apprehended introduction of railroads in the immediate vicinity of all the most productive canals, but one canal in that country has as yet, been proposed to be converted into a railroad, and that, from considerations very peculiar to itself.

These are so minutely, and it is believed, so correctly detailed, in a recent essay which appeared in the National Intelligencer, that it has been deemed expedient as well as proper to attach it to this note.

The length, lockage, and cost of the canals included in the preceding table, are derived from a work of unquestioned authority, by *M. Huerne de Pommeuse, membre de la Chambre des Députés*, originally written in French, and, it is believed, not yet translated into English. Its other facts are from the "*Trade Lists.*"

It is obvious, under the circumstances disclosed by this table, that railroad stocks, yielding, on the same amount of capital, a half, a fourth, or a tenth even, of the profit of certain canals, in the same neighborhood, would furnish profitable investments for money. And engineers of every description, therefore, and pamphleteers too, would not be wanting, after the canal system of that kingdom had been already pushed to the utmost limits of its land and water, to recommend railways in preference to canals.

The following receipts on certain American canals, charging for toll and transportation together, not more than three cents a ton per mile; two cents being the average toll on one, the price of transportation, deserve consideration here.

That a canal may be profitable with a toll not exceeding an average amount on its tonnage, of two cents a ton per mile, it may not be immaterial to notice the total amount of tolls on the New York canals, which have cost about $18,000 a mile, or about 7½ millions, and the Schuylkill navigation, the stock of which is now at an advance, in the American market, of near one hundred per cent. on the share of $100.

Extracts from the letters of Hamilton, containing "A brief view of the system of internal improvement of the State of Pennsylvania," by M. Carey, M. A. P. S., and of the Antiquarian Society, published in Philadelphia, in 1831.

"New York did not begin to collect tolls on her canals, except on a very small scale, before the fall of 1822, above five years from the time when they were commenced.

"Canal tolls, 1821,	$ 2,220
1822,	44,486
1823,	89,988
1824,	319,320
1825,	521,345
1826,	750,759
1827,	847,759
1828,	897,265
1829,	771,685
1830,	1,056,922
1831,	1,193,435"

The following are the chief articles that reached Albany, by way of the canal, in 1830:

Barrels of flour,	396,900
ashes,	25,670
provisions,	22,008
salt,	42,601
whiskey,	28,207
Hogsheads of whiskey,	1,420
Boxes of glass,	6,374
Barrels of lime,	2,404
Bushels of wheat,	209,011
corn, rye, and oats,	114,989
barley,	182,783
Cords of wood,	12,976
Feet of timber,	31,621
Shingles,	11,810,000
Feet of lumber,	25,832,142

"New York is destitute of coal, one of the greatest sources of canal tolls. She, it is true, derives a small supply of iron from the borders of Lake Champlain. But that the amount is insignificant, appears from the fact, that the total tolls of the Champlain canal, up and down, were, last year, only 89,053 dollars."

"The tolls of the Schuylkill Navigation Company, last year, were 148,165 dollars; of which, 87,195 dollars were received on coal, being about sixty per cent. of the whole."

The supplies of not only iron, but of lime, for manure, as well as cement, must depend on the vicinity of coal to the ore bank, and the quarry.

Increase of tolls on the Schuylkill Navigation.

Years.	Tolls on coal.	Total tolls.	Tonnage.	Price of stock: shares, $100 each.
1825	-	15,775	-	January, 1826, = 75 to 80
1826	-	43,108	32,404	" 1827, = 95 to 101
1827	33,317	58,149	65,501	" 1828, = 101 to 102½
1828	46,202	87,171	105,462	" 1829, = 100 to 101
1829	77,032	120,039	154,504	" 1830, = 160 to 165
1830	87,195	148,163	180,785	" 1831, = 176 to 180

The works of this canal "are, in extent, about 108 miles; commencing at the Lancaster Schuylkill bridge, and ending at Mount Carbon: of which 62 miles are by canals, and 46 by pools in the river. The number of houses for lock-keepers, is 65; the number of locks below Reading, 39; and above, 81: being, in the whole, 120, (of which 28 are guard-locks,) overcoming a fall of 588."

In 1826, the amount paid for this improvement, was		$1,704,948 80
	for land, - -	63,405 64
	for damages, - -	39,701 73
	Total cost, - -	$1,808,056 17

exclusive of interest on loans, and securities.

In the same annual report of this company, from which the above is extracted, is the following testimony in favor of large canals: "The pools having towpaths along them, are a very important, and, it is believed, when finished, will be a favorite part of the navigation, with those who use them; for it is a fact worthy of notice, that a horse, towing a boat, will, with greater ease, go at the rate of four miles an hour, in a pool, than three miles in a canal."

This proposition is in accordance with the experiments of the French academicians, on broad and narrow canals; and corroborates the policy which has given such enlarged dimensions to the Chesapeake and Ohio canal: while, in every other respect, the navigation of the eastern section of the Chesapeake and Ohio canal will be much less obstructed by locks, in proportion to its length, than the Schuylkill navigation; the stock of which is now near, or quite, 100 per cent. above par.

From the National Intelligencer.

Messrs. Gales & Seaton:—To an impartial press, whatever tends to guard the public mind from delusion, and especiallly in relation to topics of national interest, must be acceptable.

I confidently, therefore, anticipate your ready admission into your useful columns, of the correction of an error current in the gazettes of the United States, that canals are, every where in England, giving place to railroads: and, as conclusive evidence of this, that the Bolton, Bury, and Manchester Canal Company have offered their canal for the site of a railway.

The first position is no further true, than that, as almost all the canals that could be made, and many that ought never to have been made, have, long since, been constructed in England; as some of them have proved the richest monopolies known to the world, railroads have, of late, arisen to compete with them for a share of their dividends. These have been, and still are, so considerable, as to occasion an advance, on the original price of canal stocks, in some cases of a thousand, in others of two thousand and three thousand, and in one case, of more than four thousand per cent.

But, as I have suggested, very near, or quite half of the canals of England, having great lockage, little water, and less trade, have proved, from their very outset to the present day, of little, or no value to the proprietors of their stock. This has indeed, in some cases, so completely disappeared from the money market, that neither the weekly "*Trade*," nor any other "*list*" of prices, pretends to state what is its selling price.

Examine, not the present merely, but the past condition of the canal, connecting Manchester with the towns of Bolton and Bury; since this is triumphantly adduced as a canal: the only one, indeed so quoted, which has been offered, by its proprietors, as part of the site of a railway, to be constructed between Manchester and Leeds.

This canal, I have seen; but I do not, for that reason, ask the least reliance on my authority for the facts respecting it, which I am about to state.

Rees' Encyclopædia, Bradshaw's maps of the canals and railways of the midland counties of England, and similar sources of intelligence, may be appealed to, for the verification of my statements: and to them I refer the reader.

The canal between Bolton and Manchester, one of the straightest in England, is eleven miles long: the branch to Bury intersects it, three miles from Bolton, and is, in length, about four miles; so that, both together, being the property of one company, make 15 miles: and while the distance of Bolton from Manchester is 11, that of Bury from the same place is 12 miles.

There are 12 locks on this canal, and two costly aqueducts over the rivers Irwell and Leven. It was fed, in 1799, by the former of these rivers, but in 1802 it was found necessary to construct a reservoir at Ralcliffe. Its construction exceeded in price 30,000 dollars a mile. The shares of its stock, in number 447, orginally cost £250 sterling; were selling, as far back as 1824, at £112 sterling each; having then fallen below one half of their former price.

The object of this canal was to reach Liverpool through Manchester, by the Duke of Bridgewater's canal, with which it is there united by means of the Medlock brook. From Manchester, the cheapest and safest water communication with Liverpool is by the Duke of Bridgewater's canal, of 29 miles, to Runcern, where that canal enters the river Mersey, and thence along the open bosom of that broad river, often too rough for canal boats, 16 miles more, to the harbor of Liverpool.

The whole water communication of Bolton, with Liverpool, thus composed, is therefore 56 miles in length. The cost of carriage on the part of this line of intercourse between Manchester and Liverpool, the memorial to the British Parliament, in behalf of the Liverpool and Manchester railway, stated to be 15*s.* sterling per ton, which that memorial promised to reduce by means of the railroad, 10*s.* a ton. The cost of carriage cannot be less from Bolton, which by water is 11 miles farther from Liverpool than Manchester.

But the distance of Bolton from Liverpool, *over land*, is less by three miles than that of Manchester from Liverpool by the recently constructed Manchester and Liverpool railway. This railway, moreover, approaches within two and a half miles of the town of Leigh, at a point 17½ miles from Liverpool; and from Leigh to Bolton, a distance of about seven miles, a railroad has been already constructed, by authority of an act of Parliament, which passed in 1828. So that while the water communication between Bolton and Liverpool, mixed, circuitous, and hazardous, is 56 miles in length, that, by land, is 27 miles, of which, all but 2½ miles consists of a highly improved railway; and while the cost of transportion for a ton of goods, by water, from Bolton to Liverpool, does not fall short of 15*s.* sterling, that by land cannot exceed 10*s.* sterling.

The same considerations apply with nearly equal force to the short branch to Bury, which is a few miles east from Bolton.

It is difficult, then, to account for the willingness of the proprietors of this canal to surrender it for a railway or any other purpose, to any one who will take it off their hands, and pay them any thing for it.

If, indeed, the carriage, *by water*, from Bolton to Manchester, *thence*, by the Duke of Bridgewater's, now the Marquis of Stafford's canal, and the river Mersey, which spreads out to great breadth, below Runcern gap, a distance in all of 56 miles, could be reduced from 15*s.* sterling or 3.60 cents, to 3 cents a ton per mile, the entire cost of transportation of most heavy commodities on the canals of New York, Pennsylvania, and Ohio, then indeed the case would be not quite so hopeless for the Bolton canal.

Ten shillings sterling per ton, the price now charged on the railroad for transporting a bale of cotton from Liverpool to Manchester, a distance 29¾ miles, measured from the wharf of Liverpool to the entrance of Manchester, if this sterling money be turned into American currency, with a suitable allowance for the difference of exchange and the relative value of the metallic mediums of the two countries, is not less than $2 40 cents, or eight cents a ton per mile, for the cost of transportation on this much vaunted road; a charge not too great, considering the cost of the road, which is now known to have been, all charges included, about 140,000 dollars a mile.

The American charges for canal transportation, at 2 cents per ton per mile for toll, and one for freight, which last is quite high enough, would reduce the cost of carriage on the line of 45 miles, between Manchester and Liverpool, to 1.36 cents the ton, or 1.05 cents less than the present charge on the railroad of 30 miles, between the same places; and adding 11 miles, or 33 cents, for the distance, from Manchester to Bolton, still the advantage, excluding any allowance for the danger and delays, of 16 miles of open river navigation, of the water, over the land transportation, between Bolton and Liverpool, would be 72 cents on the ton; or quite enough to keep the carriage in its old track.

As to the river Mersey, from Runcern, it is open to every one. What the Marquis of Stafford may charge on what was once the Duke of Bridgewater's canal, subject to the restraints of the charter under which he holds his title, it is for himself to decide. But if the exclusive advocates of railroads, either in this country or in England, find any cause for exultation in the preceding facts; let them rejoice! If they question the facts, let them adduce their conflicting evidence, and they shall again hear from

TRUTH.

P. S. It would seem but fair that those editors of newspapers who have innocently, in many cases, I have no doubt, led the public into error, should furnish, by publishing the preceding statement of facts, the means of its correction.

A fair experiment of the relative utility of railroads and canals, would depend on so many circumstances, as regards their relative plans, location, cost, and species of traffic, that many years would be consumed in bringing it to a satisfactory conclusion.

In the first stages of such an experiment, a canal, liable to frequent interruptions from the unsettled state of its banks, would labor under great comparative disadvantages; while the railroad would possess the recommendation of being new, and, therefore, in its most perfect condition. Their relative profits would depend, of course, on the proportion of their nett income, to the cost of their construction, and the former subject of this comparison would, itself, depend on the expense of those very repairs, which would be diminishing, on the canal, as its banks acquired stability from time, and increasing upon the railroad, as use impaired its strength, by friction, frequent changes of temperature, and unforeseen accidents.

As to the relative speed of transportation on both, the decision of that question must await the equal use of both the canal and railroad, for a considerable period, and under various circumstances, by the same amount of tonnage. It is difficult even to conceive how a railroad, with but two tracks, and having both occupied, at the same time, by very numerous and heavy laden cars, moving in opposite directions, can admit of the velocity, which it is believed, a boat may attain, on a canal, without the slightest interference with any other vessels moving on the same surface, in opposite directions, and with different velocities.

Of the possible application of steam, to canals, not indeed, to such canals as those which so often occur in England, but to the canal of the Forth and Clyde, in Scotland, which is near the same breadth with the Chesapeake and Ohio canal, a doubt can no longer be entertained, notwithstanding the numerous and very confident authorities cited to disprove it, by the Baltimore and Ohio Railroad Company; all of which, indeed, derive their whole force, as they doubtless do their existence, from their application to the comparatively narrow and shallow canals of England.

A reference to the able essay of the practical civil engineer superintending the Lehigh Coal and Navigation Company's works in Pennsylvania, who, having both a railway and a canal under his charge, with abundant experience, has no motive whatever to deceive himself or others, will shed more real light, on this inquiry, than all the British authorities united; and his suggestions of various modes of diminishing the expense, and of accelerating

the speed of transportation on canals, while it evinces his mastery of his profession, may inspire at least a doubt, whether *mechanical genius* may not hereafter find as full exercise for its invention, in improving the navigation of canals, as in propelling railroad cars.

When, therefore, the appeal to public opinion will be so far settled as to enable the Federal Government to decide a question, which now perplexes the civil engineer, cannot, probably, be determined.

One thing which is certain, appears not to have been generally known, that the Chesapeake and Ohio Canal Company depend on the prosecution of their work, above "the Point of Rocks," for a supply of water to five and twenty miles of their canal, now nearly completed, below that point; and, therefore, that the result *of the experiment which has been recommended*, could not be patiently awaited, by that company, without most serious loss to their stockholders, and to the public.

If, as two of the most eminent civil engineers have said, after careful inquiry, the internal intercourse of England be not sufficiently active to warrant the use of *stationary steam engines*, on such a railroad as that between Manchester and Liverpool, the cost of which, it is ascertained, exceeds $130,000 a mile, it must be manifest that the United States cannot, in the present state of their population and commerce, avail themselves of the cheapest propelling power applicable to railroads.

Whether America be ripe for the profitable employment of *locomotive engines* between her chief cities, or between those cities and the country which sustains them, is a question yet to be tried and determined by experience. If mere animal force be, at present, the most economical moving power on railroads and canals, then their relative value is admitted to be unequivocally settled in favor of the latter.

Railroads are universally acknowledged to be greatly superior to all other roads; and the time may, and probably will arrive, in the United States, when, constructed with many tracks, for carriages moving at the same time, with different velocities, in the same as well as in opposite directions, and propelled by *stationary engines*, having sufficient occupation to sustain their constant, and therefore profitable use, railroads will prove formidable, if not successful, rivals of canals. In the interim, it cannot be wise, or prudent, to arrest the improvement of a country, by institutions suited to its actual condition, because, it is expected that, at some future and distant period, these may be superseded by inventions of more expensive structure and costly application.

In the progress of navigation, the floating raft, the bark canoe, the open boat, and the decked vessel, varying in size, from the light sloop which scuds along the coast, to the magnificent Indianman, or the awful battle ship, which braves the ocean and the storm, have all their appropriate places.

Indulging similar views of the future march of invention, should it so happen in process of time, as there is much latitude for hope, if not sufficient ground for confident prediction, that, by the introduction of steam power on canals, or the use of a part of their surplus water to propel their boats, on the principle of the action of the stationary engine on the railway, the expense attending canal navigation may be greatly reduced, and its velocity be proportionably accelerated, the spirit of liberal and enlightened competition which railroads have recently awakened both in Europe and America, will yield to commercial and social intercourse, to the union of States, and the happiness of their people, as substantial benefits, as if the most flattering promises of their exclusive advocates had been fully realized.

The following impressive caution against rash speculations in railroads, is given in a publication, entitled "an account of the Liverpool and Manchester railway, by H. Booth, Esq., treasurer to the company."

"The Liverpool and Manchester railway is a magnificent work; but it will be useful to keep in mind that such works cannot be executed except at an expense of no ordinary magnitude. This railway will cost above £800,000, including the charge for stations and depots at each end, and machinery, wagons, &c., for a carrying department. The immense traffic between Liverpool and Manchester amply justifies this outlay. But, with reference to any similar scheme in extension of the railroad system, it is desirable the projectors should impartially calculate the cost of the work, as well as the income it may be expected to produce; and especially that they should make an ample allowance beyond the first estimate of the expenditure, before they embark in the undertaking."

In an address to the members of both Houses of Parliament, from which the above is transcribed here, the following very pertinent remarks appear:

"Whatever hope and encouragement for the future may arise out of the trial of the Liverpool railway, now going on, especially as respects the consistency of speed with safety, it cannot be pretended that sufficient proof has yet been given of the main point, required to establish the superiority of railways over canals, viz.,—their GREATER ECONOMY. Of this, the reduction in the tonnage of raw cotton, in which the railway has been followed by the water carriers, is no proof; because the rate now charged, within one shilling per ton, was fixed by the railway act, at a time when the cost of its conveyance could only have been approximated by an estimate. Unless however, the cardinal point of greater economy can be clearly made out, the advantages of the railway will be limited, as is still the opinion of many of the best judges) to those cases, in which an extra-price can be afforded, for the rapid conveyance of passengers, and of those lighter articles of merchandize which are required to supply immediate demands. The proof which is required must consist, not in ESTIMATES or CALCULATIONS; for of the fallaciousness of these we have already had sufficient experience in the case of the Liverpool railway, the cost of which (upwards of £30,000 *per* mile) is more than double the estimate;—but in *bona fide* evidence, to be derived, at a fit season, from a fair winding-up of the accounts of the concern;—from a balance sheet proving that after paying interest on the sunk capital, and defraying the current expenses, there will be a surplus of actual profit, however moderate, to be divided among the proprietors. Such an investigation, it is obvious, cannot be entered upon at present, with any trust-worthy result. It will require that the railway should be completely finished;—that the sufficiency of the work should be ascertained by longer experience;—that the solidity of the foundation, the durability of the road and embankments, should be fairly tried;—that the wear and tear of the rails, carriages, and machinery, should be determined, both under the present system of exclusive use by the company of proprietors, and when thrown open, as carriers in general. These, and a variety of other data, hitherto unknown, must be acquired by actual experience, before it can be pronounced, with just confidence, that railways can carry at a cheaper rate than canals. They are points upon which directors and engineers can at present offer nothing but random conjectures, quite unworthy of being made the ground of undertakings, which will absorb many millions of the capital of the nation."

P.

A reference to the last annual report of the Baltimore and Ohio Railroad Company, in order to ascertain the cost of transportation on that road.

The report of the Pennsylvania Canal Commissioners quote from the late annual report of the Baltimore and Ohio Railroad Company the present estimated cost of their road, and state it to be 27,228 dollars per mile. They notice, that of the 71 miles of this road, so estimated, no less than two-thirds are laid with wooden sills, or rails, and that the branch to Frederick, of 3½ miles, is of one track only; but they do *not* notice, that the viaduct of this road across the river Monocacy, over which the Chesapeake and Ohio Canal Company are constructing an aqueduct of white granite, is of wood resting on stone piers, and estimated at a cost less by $1000 per mile, on the entire railway, than the cost of this stone aqueduct; nor do they notice that no charge whatever is made, in the above estimate, for the fixtures and machinery of the inclined planes at Parr's ridge, which are, however, as necessary a part of the road as a lock is of a canal.

The Pennsylvania Commissioners, also, remark, that this company state, "that it required 6½ months to lay down 6 miles of stone track," and "that the cost of laying with stone has been underrated in every instance," but they do not remark, that the reason given by the Railroad Company, in their last annual report, for not using stone on two-thirds of their road, or on their Monacacy viaduct, is, that the adjacent country could not supply it; and if this be true, to replace hereafter the wooden by stone rails, must be a work of much enhanced cost.

Making due allowance for all these considerations, it cannot be deemed unreasonable to estimate the construction of the Baltimore and Ohio railroad, when made of durable materials, and with two tracks, at a cost not less, at any rate, than 30,000 dollars a mile.

It would have been very gratifying to public curiosity if the annual report of this company, made early in October last, had either stated the amount of the dividend of profit on the stock of the company, for the preceding year, which was done by the antecedent annual report, and then promised for every succeeding year; or that this report, which does state the gross amount received for transportation, had also stated the nett revenue of the company, from the 13 miles of the railroad, the only part which has been in common use, and the part on which the former dividend was declared.

This information would have cast some light on, by far the most important question remaining to be solved, at least in the United States, as to the annual expenses attending the transportation and repairs of railways, compared with canals. As to their *relative prime cost*, it is now to be presumed, that the current error which has hitherto prevailed on this subject, has been corrected by actual experience, the best test of truth in every branch of practical philosophy. Whatever may be the scientific calculations in Europe, the actual, as well as estimated, cost per mile of the Maryland and Pennsylvania railroads, designed to consist of two tracks only, exceed in amount, per mile, the average cost of their canals.

With regard to the only railroads in America, in relation to which we have any disclosure of the annual cost of repairs, and of the expenses of transportation, other than tolls, it must be admitted, on the concurrent authorities already cited in this appendix, from New York and Pennsylvania, that

they greatly exceed the usual repairs and the long and well established rate of carriages on canals of ordinary dimensions.

In relation to the Baltimore and Ohio railroad, it is understood that every thing respecting the original purchase and repairs of the cars or vehicles for transportation is under the care of a special committee of the Directors, whose expenditure on these subjects, for the preceding year, does not appear in their late annual report. Indeed, the gross revenue, as well as the gross expenditures for transportation, from October, 1830, to January, 1831, no where appear in the report.

In a table of the aggregate revenue from tonnage and passengers, from January to September, (both months included,) of 1831, the gross amounts stated to have been received is $27,249 74 cents for passengers, and $4,155 50 cents for tonnage, making a total sum of $31,405 24 cents.

In another table, under the head of "expenses of transportation," from which might be inferred, but for the preceding report of the Superintendent, that the *total expenses* were meant; we have an analysis, which excludes the original cost of carriages, or even the interest on that cost, as well as any estimate or charge for their repairs. The recapitulation of those expenses furnishes,

For the undefined item of "Moving power, - -	$5,526	55
Drivers and engine men, -	1,763	45
Agents and conductors, -	1,901	32
Depot expenses, - -	1,066	39
Oil, - - -	254	98
Contingencies, - -	482	18
Making the total expenses of the preceding nine months,	$10,994	87"

On the 19th page of the report, "the *machinery* and *moving power*" are treated of under one head; but, if the phrase "*moving power*," applies to the animal labor, and locomotive steam engines, employed to draw or propel the carriages and cars, it is presumed, then, the cost of the carriages, and of their repairs, is not included in the above list of expenses, and so we are told by the Superintendent.

In the estimate, accompanying this report, of the probable expenditures of the company during the ensuing twelve months, "the construction of the necessary cars and locomotive engines is computed to cost $150,000." (See page 102 of the report.) Some expenses of a similar character must have occurred in the nine months of the past year, but, after a diligent examination, it does not appear that any part of it has been charged upon the current receipts for transportation or the revenue of the year.

In like manner, the Superintendent of construction on this road, in his report to the principal engineer, on the 30th of September, 1831, apprises him that the "railway in the city and first division of the road has undergone a thorough examination, and *such repairs as appeared necessary* have been made." Now we learn from the 12th page of the report, that this first division extends to Ellicott's mills, or all the road in use. But there nowhere appears any statement of the cost of the repairs of this division, nor does the gross revenue from transportation appear any where to be charged with them, or with any part of them. And yet, it must be very obvious, that the actual cost of carriage, on a railway, cannot be ascertained without a due reference to those items of unavoidable expenditure.

Although, therefore, the annual report of this company explicitly states, that "*upon reference to the report of the Superintendent of transportation, hereto annexed*, it will be seen, that 81,905 passengers have passed on this division, since the first of January last, and that, within "the same period, 5931 tons have been transported upon it, yielding an income of $31,405 24 cents, and *involving an expenditure of* $10,994 87 cents, it is very evident, that this is not the only expenditure involved in this transportation, and that, so far, the statement of the report is calculated to mislead the public judgment, as to the proportion between the gross receipts and the nett profit on the transportation of the railroad.

Indeed, the preceding statement of the President and Directors in their annual report, is the more extraordinary, since the Superintendent of transportation, whose annual report to the President is quoted by them, most expressly says, in the body of his report, that he has "exhibited a return of the actual expenditures by the company, under the head of '*expenses of transportation*,' amounting to $10,994 87 cents; but *these*, as will be perceived," he candidly adds, "do *not include any charges* for the *construction*, the *repairs*, or the *wear* and *tear* of *wagons and cars;* and he properly adds as the reason, "that branch of the service of the company *being under the immediate care and superintendance of a committee of the board.*" A fact to which this is their only allusion in their annual report.

In the "general remarks" of the engineer in chief of this company, on the 100th page of this report, he states, as a result of those "improvements on Winan's car," which have so greatly reduced the friction of railroad carriages, that "the working effort of a horse, on a level, would draw 18 *tons*, 2½ miles per hour."

Now, if these improvements have been introduced on this road, which cannot be doubted, against the authority of the engineer in chief, we have that of the *Superintendent of transportation*, who, on the 129th page of this very same report, says, "that, for some months past, a *series of experiments* have been made, with the view of ascertaining, *practically*, the *force of traction*, at a *slow draft*, *horses* can exert consistently with the preservation of their *vigor* and *health*. It has been found that, graduated, as this road is," (its graduation and masonry alone the same report states to have cost $46,354 56 cents per mile,) "and each horse moving 3 miles per hour, he can traverse the 13 miles westwardly with 7 tons, and returning he can transport 10½ tons." In going, let it be remarked, the horse reaches a higher plane, in returning, he descends to a lower.

The Superintendent's report corresponds with the British authorities on the same subject; but, if the *maximum* power of a single horse, on a level railroad when drawing Winan's improved car, be computed, as it has been, by *the engineer in chief* of this company, and it is very probable that he does not *underrate* it, since he makes it near twice the British estimate, still, the Chesapeake and Ohio canal has nothing to apprehend, from the exertion of animal power on this rival railway- a single horse having drawn, at his usual walk of 2½ or 3 miles an hour, with apparent facility, more than five and forty tons, on this canal, for many hours together.

By turning to the analysis made by Josiah White, the able director and superintendent of the Lehigh Coal and Navigation Company, it will be seen, that the annual repairs of carriages on the Mauch Chunk railroad actually amounted "to two-thirds of a cent a ton per mile;" while the same authority apprises the public that the total cost of transportation on the Erie

canal, "for boats of 40 tons burthen," is "one cent per mile, full loads one way and returning empty." "Calculating on the same data on a boat of 67 tons, (33 tons less than those of the Chesapeake and Ohio canal,) such as will be adapted to the Delaware canal," he makes the cost of transportation "seven-tenths of a cent per ton a mile." The mere expense of the repairs of carriages, omitted in the last annual report of the Baltimore and Ohio Railroad Company, from among the items of the cost of transportation on their road, will, therefore, be found to exceed the *entire cost of transportation* on the Chesapeake and Ohio canal.

There remains, in fact, but one element of a just comparison between those works, to be ascertained by experience, to determine the relative economy of their use; that is, the sum required for their respective annual repairs, or to maintain against natural decay, and the injury from use, the value of the fixed capital vested in them respectively, that capital being, in fact, proved to be very nearly the same in amount. Railroads as often exceeding canals in their original cost, as they fall short, the price of both being dependant on their location and dimensions, and the peculiar character of the ground they respectively pass over.

(S.)

From the subjoined act, it will be seen, in what relation the United States stand, towards the creditors of the District Corporations, for the loans of the million and a half, negotiated in Holland, under the authority of this act; and, to what an oppressive extent, the enforcement of the payment of those loans, would operate on the holders of property in the District of Columbia, provided the Chesapeake and Ohio canal should be regarded and treated by Congress, as a mere experiment, to test the relative value of railroads and canals.

ACT OF THE CONGRESS OF THE UNITED STATES.

An act to enlarge the powers of the several Corporations of the District of Columbia, and for other purposes. [*Approved, May* 24, 1828.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Corporation of Washington, the Corporation of Georgetown, and the Corporation of Alexandria, within the District of Columbia, shall, severally, have full power and authority to subscribe and pay for shares of the stock of the Chesapeake and Ohio Canal Company; and all such subscriptions as shall have been already made by either of the said Corporations, shall, and the same are hereby declared to be valid and binding on the said Corporations, respectively.

Sec. 2. *And be it further enacted,* That the said Corporations shall, severally, have power and authority, from time to time, as the same may be deemed by them, respectively, either necessary or expedient, to borrow money, at any rate of interest not exceeding six per centum per annum, to pay their respective subscriptions, and the interest accruing thereon, to the amount which they have subscribed, or shall hereafter subscribe.

Sec. 3. *And be it further enacted*, That the said Corporations shall be, and the same are hereby, respectively, empowered to cause to be constituted certificates of stock for the sums borrowed, in pursuance of the authority severally vested in them by this act; each of the said certificates shall be of the form following, to wit:

"City (or town) of [here insert the title of the city or town.]

Mayor's Office.

"Be it known, that there is due from the Corporation of the city, (or town of) [here insert the title of the city or town of] unto ——— [here insert the name of the creditor] or ——— assigns, the sum of ———, [here insert the amount in dollars] bearing interest at [here insert the rate of interest] per centum per annum, from the ——— day of ———, eighteen hundred and ———, inclusively, payable quarter yearly; the principal sum abovementioned, is to be paid on the ——— day of ———, in the year eighteen hundred and ———, which debt is recorded in this office, and is transferrable only by appearance, in person, or by attorney, at this office.

"In testimony whereof, I have hereunto subscribed my name, and caused the seal of the said city to be affixed.

——— ———, Mayor.

——— ———, Register."

[Or other recording officer of the Corporation.]

A list of all such certificates, denoting their respective numbers, dates, and sums, and the persons to whom the same shall have been issued, authenticated by the Mayor subscribing the same, shall be deposited by said officer, at the time of subscribing the same, or within ten days thereafter, with the Secretary of the Treasury of the United States.

The said certificates shall not be issued in any case, for a less sum each, than one hundred dollars. The forgery of any such certificate, or of any transfer thereof, or of any power of attorney, purporting to authorize such transfer, shall be punishable in like manner with the forgery of a certificate of the public debt of the United States.

Sec. 4. *And be it further enacted*, That the said Corporations are, respectively, empowered to employ an agent or agents, for the purpose of obtaining subscriptions to the loan or loans authorized by this act, or of selling, from time to time, the certificates of stock which may be created in pursuance thereof, and to fix the compensation of such agent or agents, which they shall respectively pay, as well as all other expenses attending the said loans, out of the proceeds thereof, or of any other funds which they may respectively provide.

Sec. 5. *And be it further enacted*, That a tax, at the rate of one per centum, and thirteen hundredths of one per centum, on the assessed value of the real and personal estates within the City of Washington, as shall appear by the appraisement thereof, made under the authority of the Corporation, or of the several acts of Congress, hereinafter declared to be revived and in force, within the said Corporation, to be existing at the time hereinafter limited for the collection of the said tax; and at the rate of fifty-six hundredths of one per centum on the assessed value of the real and personal estate within the town of Georgetown, as shall appear by the appraisement thereof, made under the authority of the Corporation, or of the several

acts of Congress, hereinafter declared to be revived and in force, within the said Corporation, to be existing at the time hereinafter limited for the collection of the said tax; and at the rate of fifty-eight hundredths of one per centum on the assessed value of the real and personal estate within the town of Alexandria, as shall appear by the appraisement thereof, made under the authority of the Corporation of the said town, or of the several acts of Congress, hereinafter declared to be revived and in force, within the said Corporation, to be existing at the time hereinafter limited for the collection of the said tax; be, and the same is hereby, imposed and assessed on the real and personal estate lying and being in the said city and towns: and, upon the failure of the said Corporations, or of any of them, to pay, into the Treasury of the United States, ninety days before the same shall become due, to the holder of the shares or certificates of such loan or loans, as aforesaid, according to the terms and conditions thereof, the sum or sums which they, or any of them, shall have respectfully stipulated to pay at the expiration of the period aforesaid, so that the same shall not be ascertained beforehand to be in readiness to meet the demand or claim about to arise on the shares or certificates of the said loan—the President of the United States shall be, and he is hereby, empowered to appoint a collector or collectors, whose duty it shall be to proceed and collect the tax imposed, as above, on the real and personal estate in the said city and towns, or either of them, the Corporation or Corporations of which shall have so failed to pay, as aforesaid, in advance, the sum or sums about to become due and demandable as aforesaid, or any part thereof remaining unpaid, as aforesaid, into the Treasury, ninety days in advance; such part, in case a part only be so in arrear, to be ratably and equally assessed, levied, and collected, upon the property chargeable as aforesaid, with the said tax, within the said city and towns, or either of them, making such default in paying as required, ninety days in advance, as aforesaid: the appraisement or assessment of the value of the said estates, preparatory to the collection of the said tax, if not previously made by the said Corporation, to be made in the mode prescribed, as aforesaid, in the several acts of Congress, hereby revived and put in operation: *Provided*, That, if satisfactory evidence be afforded the President of the United States, by the several Corporations aforesaid, that they are proceeding, in good faith, to raise and pay, in due time, their portions, respectively, of the said loan or loans, and will be competent to raise the same by the means on which they rely, he shall be, and he is hereby, empowered to restrain such collector or collectors from proceeding to collect the said tax within the Corporation affording the evidence aforesaid, until the expiration of the ninety days aforesaid, when, if the amount of the said tax be not actually paid, the collection thereof shall proceed, without further delay, on notice to the collector of such default.

SEC. 6. *And be it further enacted*, That the collector or collectors, who may be appointed as aforesaid, shall give bond, with good and sufficient security, for the faithful performance of the duties required by this act, and shall possess all the powers, be subject to all the obligations, and proceed, in all respects, in the discharge of his or their duties, in collecting the said tax, as the several Collectors possessed, were subject to, and were required to do, by an act, entitled "An act to provide additional revenues for defraying the expenses of Government, and maintaining the public credit, by laying a direct tax upon the District of Columbia," approved the 27th of February, one thousand eight hundred and fifteen, and by the seve-

ral acts of Congress therein referred to, or which were subsequently passed, in order to alter or amend the same; all of which acts, for the effectual fulfilment of the purposes of this act, and according to the tenor and intent thereof, are hereby declared to be revived, and in full force, within the limits of the several Corporations aforesaid.

SEC. 7. *And be it further enacted*, That the tax imposed by this act, shall be continued and collected, from time to time, according to the provisions and conditions of this act, and of the several acts aforesaid, so long as the proceeds thereof may, by any possibility, be required, to meet the payment of the several loans authorized as aforesaid: *Provided, however*, That all or either of the said Corporations may, in the negotiation of such loan, or loans, as they or either of them, shall deem it expedient to make, in pursuance of the authority vested in them by this act, stipulate such terms or conditions, for the payment of the interest, or the redemption of the principal sum thereof, as shall dispense with the system of taxation provided by this act.

SEC. 8. *And be it further enacted*, That, in the event that any loan or loans shall be negotiated by the said Corporations, or any one of them, to the extent, in whole or in part, of the subscription of one or all of the said Corporations, to the stock of the Chesapeake and Ohio Canal Company, in conformity with the provisions of this act, and based upon the system of taxation therein provided; a copy or copies of the contract or contracts, for any and all such loans, shall, as soon as practicable, after the execution thereof, be deposited, either by the Corporation or Corporations contracting such loan or loans, or by the creditor or creditors interested therein, with the Secretary of the Treasury; and, out of all such sums as shall be paid, by the respective Corporations, in advance, as aforesaid, on account of their several contracts, or, as shall be levied and collected, in manner hereinbefore provided, the holders of the certificates of any such loan shall be entitled to receive, at the Public Treasury, such amount as may be due to them, respectively; and, on the occurrence of any deficiency in the sum or sums, voluntarily paid in, or assessed and collected, within the said Corporations, respectively, for the payment of their respective creditors, the extent of such deficiency shall be ascertained by the Secretary of the Treasury, from a reference to the terms of the loan or loans, in relation to which such deficiency may occur; and, being so ascertained, and published in some one or more newspapers, printed in the District of Columbia, the Secretary of the Treasury shall instruct the proper Collector to proceed to collect, and pay into the Public Treasury, the said amount, with all lawful charges attending the same, according to such farther ratable assessment, upon the estates and property within the jurisdiction of the Corporation in arrear, according to the provisions of this act, and of the several acts referred to therein, as shall be sufficient to supply such ascertained deficiency; and, on the completion of such collection, the holder or holders of the certificates of the stock of the Corporation shall be entitled to receive such amount as may have been found due, and unprovided for, by the sums before paid in, or collected, on account of such Corporation.

T.

From the facts and reasoning in the preceding part of this appendix, which has been unavoidably swelled to a voluminous size, the following deductions must be apparent:

1st. That the actual cost of any canal or railroad must depend on the plan adopted for each work, and the character of the ground over which it is conducted, both as to the quality of its soil or materials, and the regularity, or inclination of its surface.

2d. That the prime cost of the best constructed railroad, of two tracks only, passing over the most favorable ground, must ever, greatly exceed the prime cost of the best constructed canal, of ordinary dimensions, passing over ground equally favorable for this species of improvement.

3d. That the best constructed railroads, of two tracks, in Europe or America, and there are none, in either country, as yet, with more than two, exceed, in their original cost, the best constructed canals in America, of ordinary dimensions.

4th. That the Baltimore and Ohio Railroad Co. acknowledged, by the last annual report of its President and Directors, to be imperfectly made for two-thirds of its extent below the Point of Rocks, and having but two tracks, will cost, per mile, nearly or quite as much, and if its obvious defects be hereafter supplied, probably more than the Chesapeake and Ohio canal, which, when done, will be the largest in the world; and, in construction, inferior to none.

5th. That the actual cost of transportation, for commodities, on the only railroad in England, of two tracks, on stone sills, fitted for the exchange of commodities between its extremes, exceeds the actual cost of transportation on any of the canals of ordinary dimensions in the United States, in the ratio of near or quite three to one, and this, whether the propelling power be animal labor, or steam.

6th. That the cost of transportation on the first and best constructed division of the Baltimore and Ohio railroad, a division which has cost $60,000 a mile, has not been reported by the President and Directors of that company, but probably exceeds the cost of transportation on the Liverpool and Manchester railroad, and is thrice as great as the cost of transportation on the Chesapeake and Ohio canal.

7th. That the relative cost of keeping up, by annual repair, the fixed capital vested in the construction of railroads, and their necessary appurtenances, and of canals, has not been, as yet, determined by actual experience for a series of years; but must prove to be greatly in favor of canals so constructed as to have no perishable structures about them, except the wood of the lock gates, and certain parts of the houses of their attendants.

8th. And hence it follows, that where great velocity is not required for the transportation of the commodities of a country, as in one, the chief commerce of which, consists of the rude productions of its forests, mines, and agriculture, canals furnish much more valuable channels of trade, than railroads.

9th. But if rapid motion be desired, such have been the late discoveries made in propelling passage boats on the canals in Scotland, that a rational and well grounded hope may be indulged, of approximating the speed of travelling on canals, very near to the useful or practical velocity on the best constructed railroads of two or more tracks.

10th. There will remain, then, to counterbalance all these considerations in favor of canals, having an adequate supply of water but one advantage in favor of railroads of any number of tracks, that of being unobstructed by ice, during that part of each winter, in which the canal may be frozen, so deep, as to be innavigable. Many winters, as far north as the valley of the Potomac,

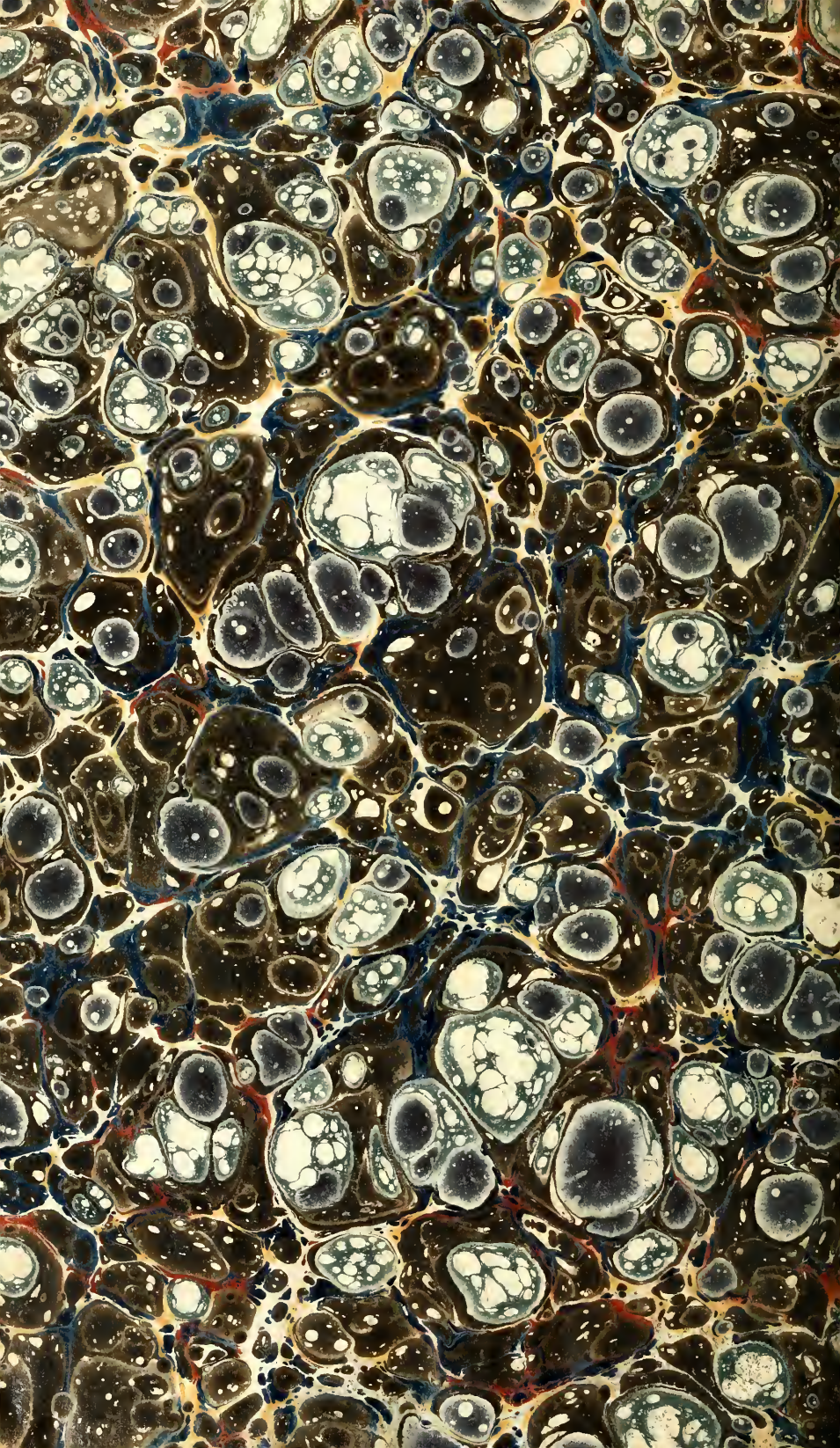
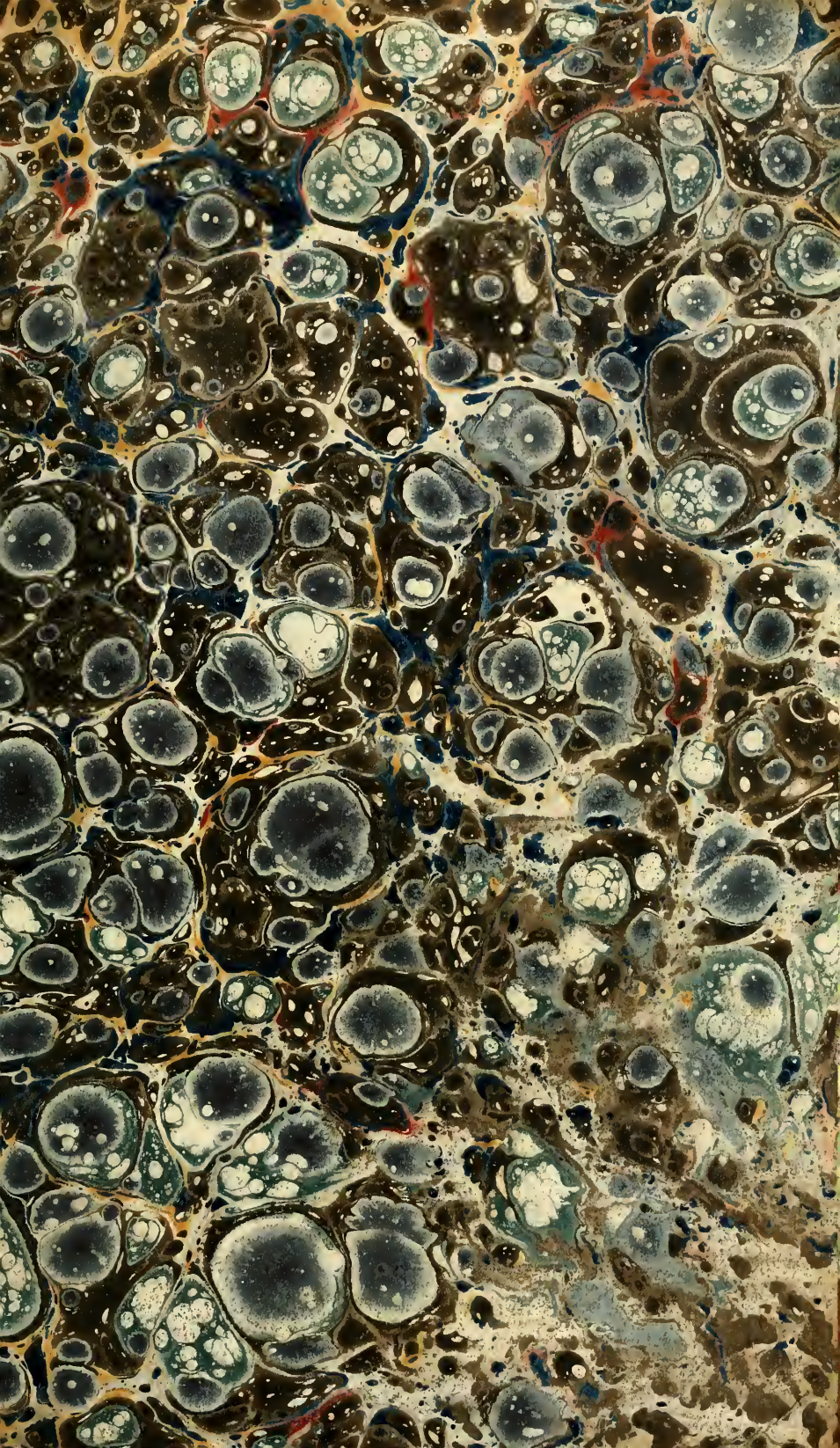
like that of 1827 and 1828, afford no ice, at any time, of the thickness of three inches. None are so intensely severe as to pass without occasional thaws. And if the ice on the surface of the canal, when three inches thick, can be overcome with such facility, by means so rude and simple, a very short period, only, of suspended navigation, in each year, remains to be remedied by future invention.

11th. To counterbalance this disadvantage, snow in winter, and dust in summer, will be more injurious to railroads, than to canals. A remedy for this last cause of objection, is purchased, as we have seen, on the Liverpool and Manchester railroad, at a heavy cost of labor. In a thinly peopled country, in passing successive ranges of inaccessible as well as lofty mountains, beneath precipices of rocks extending for miles together, the removal of drifts of snow, in winter, would be attended with still greater expense, and in snow storms or ice sleets of many hours, or several days' duration, would be nearly impracticable.

12th. The freezing of the water in a canal, is then, the sole consideration operating in the comparison unsettled between canals and railroads, to the prejudice of the former.

And on this subject, there yet remains to be stated, some facts that are not unworthy of consideration.

On the 1st of January, 1831, twelve members of the House of Representatives ascended the first twenty miles of the Chesapeake and Ohio canal, in a commodious packet boat, drawn by three horses. amidst floating ice of three inches thickness, broken only the day before. It was broken by a flat bottomed boat, of the value of six dollars, commonly called a gondola; on board of which, were 248 barrels of flour, drawn by two horses, guided by a lad of fourteen years of age, whose father received three dollars for the labor of his son and horses, who decended twelve miles and returned the same day. The boat was protected from being cut by the ice, by two green cut poles having their stump ends attached to the bottom of it, and brought together at the other ends, and fastened to the towrope. As it proceeded, it pressed the ice down, and made its way through it by crushing it to pieces, so that the gondola received no injury.

The celebrated civil engineer, to whomt he world owes so much, and whom America, his country, has so imperfectly rewarded, the late Robert Fulton, always believed that it would be very easy to construct a boat capable of freeing the navigation of canals and rivers from the obstruction of ice in winter.

In the winter of 1827 and 1828, there was not ice enough after the month of November, 1827, on the rivers of Virginia, to fill an ice house; and the ice consumed in the cities on navigable water, in the summer of 1828, was imported from New England. In the latitude of the Potomac, therefore, the possibility, whenever an active commerce shall require it, of removing the obstruction of ice on a broad canal, cannot be doubted. And with this confident expectation, the memorialists close the long protracted appeal which they have felt it their duty to make to the repsesentatives of the American people, in behalf of a national enterprize which owes its existence to their wisdom and patriotism, and which, if steadily prosecuted on the plan on which, it has been successfully begun and faithfully continued, will be completed in a few years, and remain ever after, the proudest monument of that freedom and independence which gave it birth.